US009419864B2

(12) **United States Patent**
Matsuzaki et al.

(10) **Patent No.: US 9,419,864 B2**
(45) **Date of Patent: Aug. 16, 2016**

(54) **CONTENT DISTRIBUTION SYSTEM, CONTENT MANAGEMENT SERVER, CONTENT-USING DEVICE, AND CONTROL METHOD**

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(73) Assignee: **PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 585 days.

(21) Appl. No.: **13/878,851**

(22) PCT Filed: **Aug. 22, 2012**

(86) PCT No.: **PCT/JP2012/005250**

§ 371 (c)(1),
(2), (4) Date: **Apr. 11, 2013**

(87) PCT Pub. No.: **WO2013/031140**

PCT Pub. Date: **Mar. 7, 2013**

(65) **Prior Publication Data**

US 2013/0198361 A1 Aug. 1, 2013

(30) **Foreign Application Priority Data**

Aug. 26, 2011 (JP) 2011-184347

(51) **Int. Cl.**
G06F 15/173 (2006.01)
H04L 12/24 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H04L 41/50*** (2013.01); ***G06Q 50/01*** (2013.01); ***H04L 43/0811*** (2013.01)

(58) **Field of Classification Search**
CPC H04L 41/50; H04L 67/06
See application file for complete search history.

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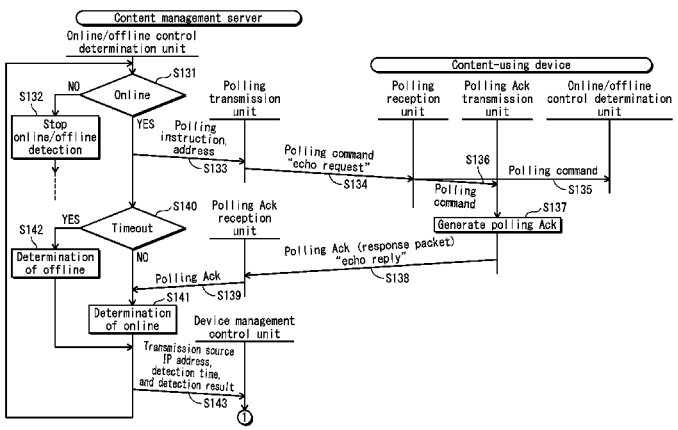
Primary Examiner — Moustafa M Meky
Assistant Examiner — Sm Z Islam
(74) *Attorney, Agent, or Firm* — Wenderoth, Lind & Ponack, L.L.P.

(57) **ABSTRACT**

A content management server comprises: a first connection detection unit that detects whether or not the content management server is connected with the content-using device; a content management unit that manages the content according to a result of the detection by the first connection detection unit and holds information on how the content-using device controls the use of the content. A content-using device comprises: a second connection detection unit that detects whether or not the content-using device is connected with the content management server; a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and a content control unit that controls the use of the content according to the method specified by the second selection unit.

31 Claims, 69 Drawing Sheets



(51) **Int. Cl.**
H04L 12/26 (2006.01)
G06Q 50/00 (2012.01)

(56) **References Cited**

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FIG. 1

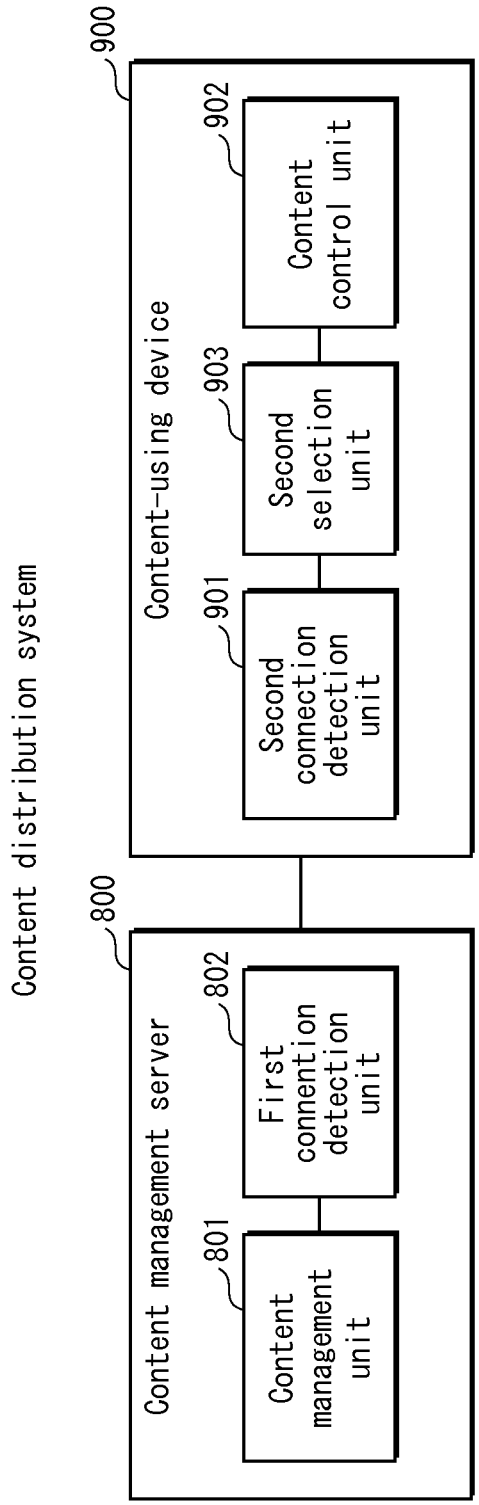

40
Content distribution system
900
Content-using device
902
Content control unit
903
Second selection unit
901
Second connection detection unit
800
Content management server
802
First connention detection unit
801
Content management unit

FIG. 2

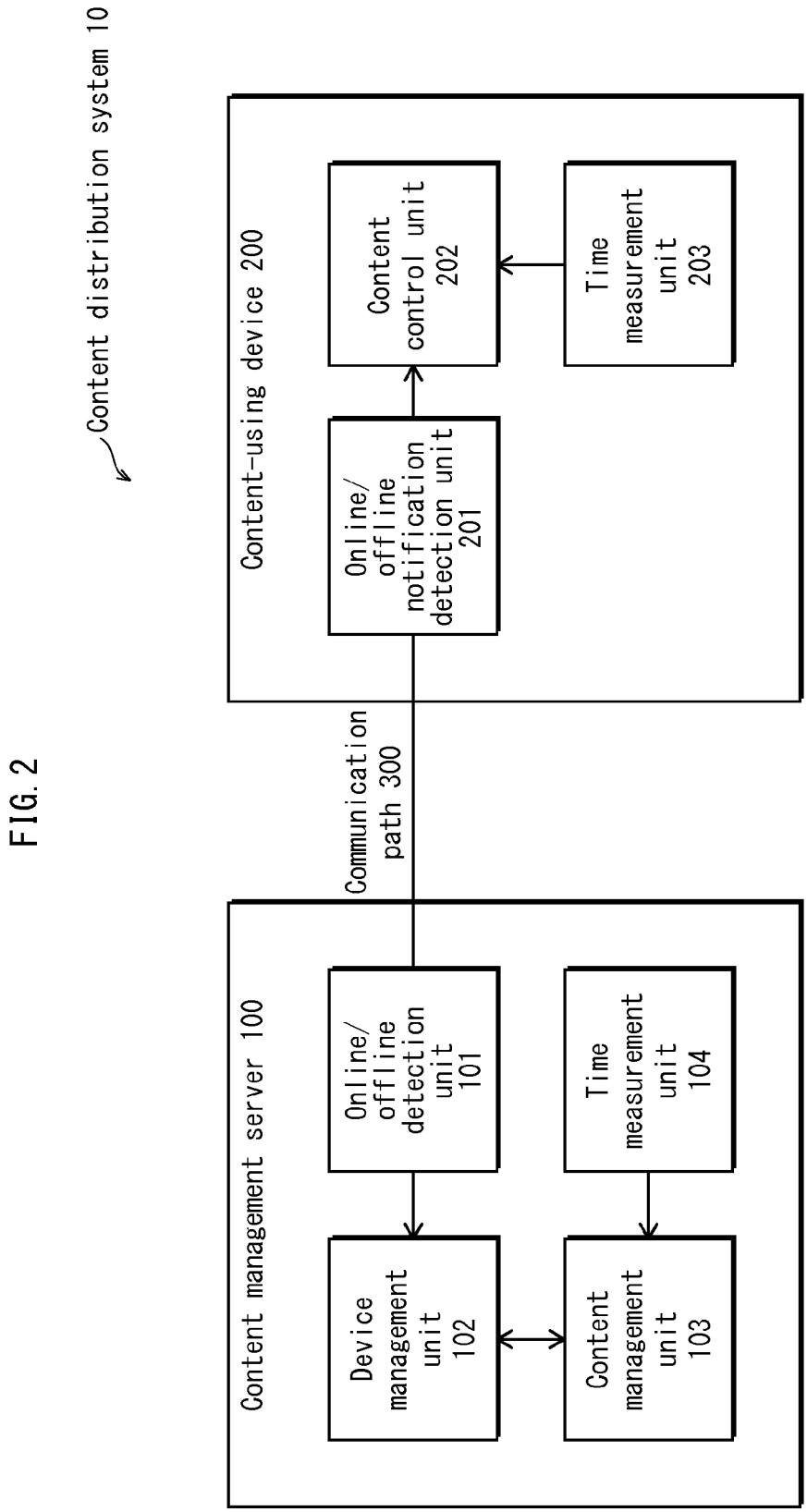

Content distribution system 10
Content-using device 200
Content control unit 202
Time measurement unit 203
Online/offline notification detection unit 201
Communication path 300
Content management server 100
Online/offline detection unit 101
Time measurement unit 104
Device management unit 102
Content management unit 103

FIG. 3

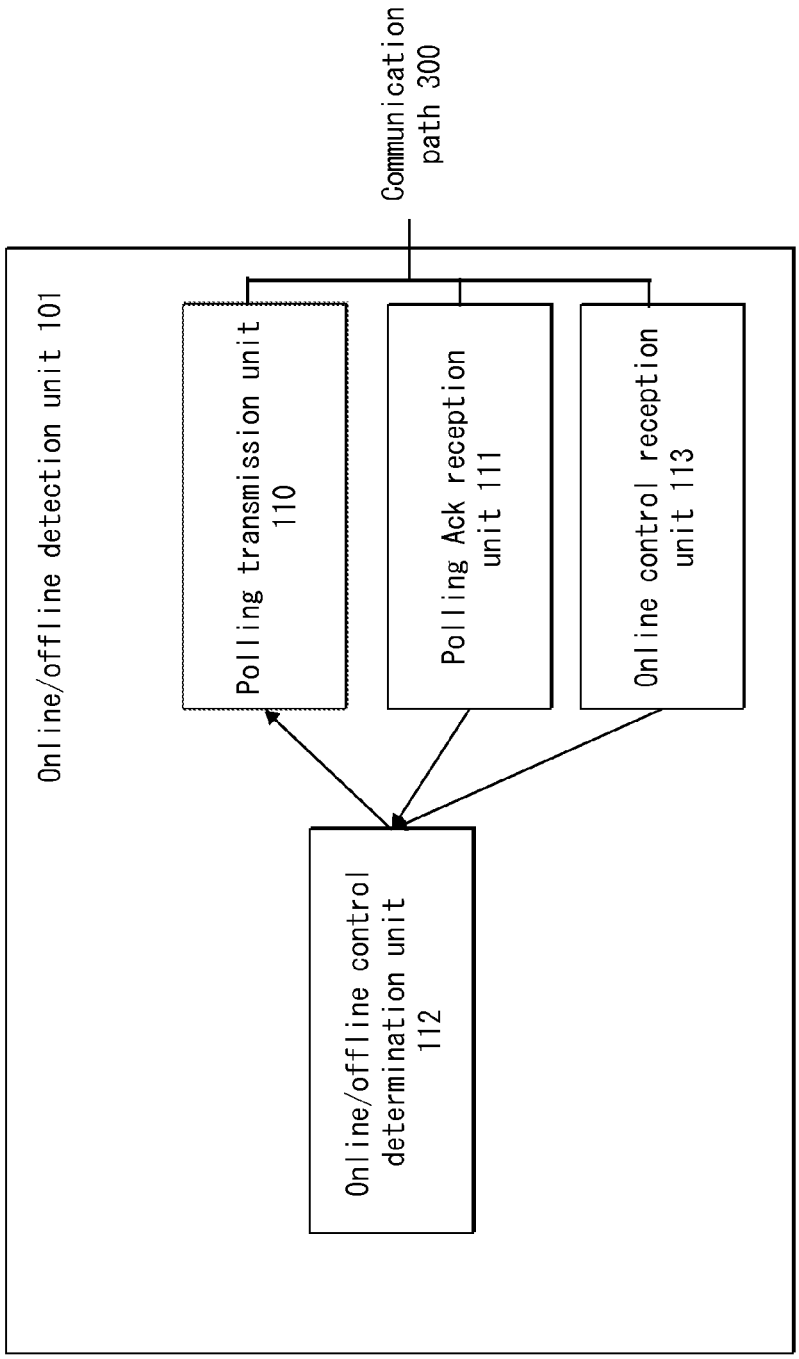

Communication path 300
Online/offline detection unit 101
Polling transmission unit 110
Polling Ack reception unit 111
Online control reception unit 113
Online/offline control determination unit 112

FIG. 4

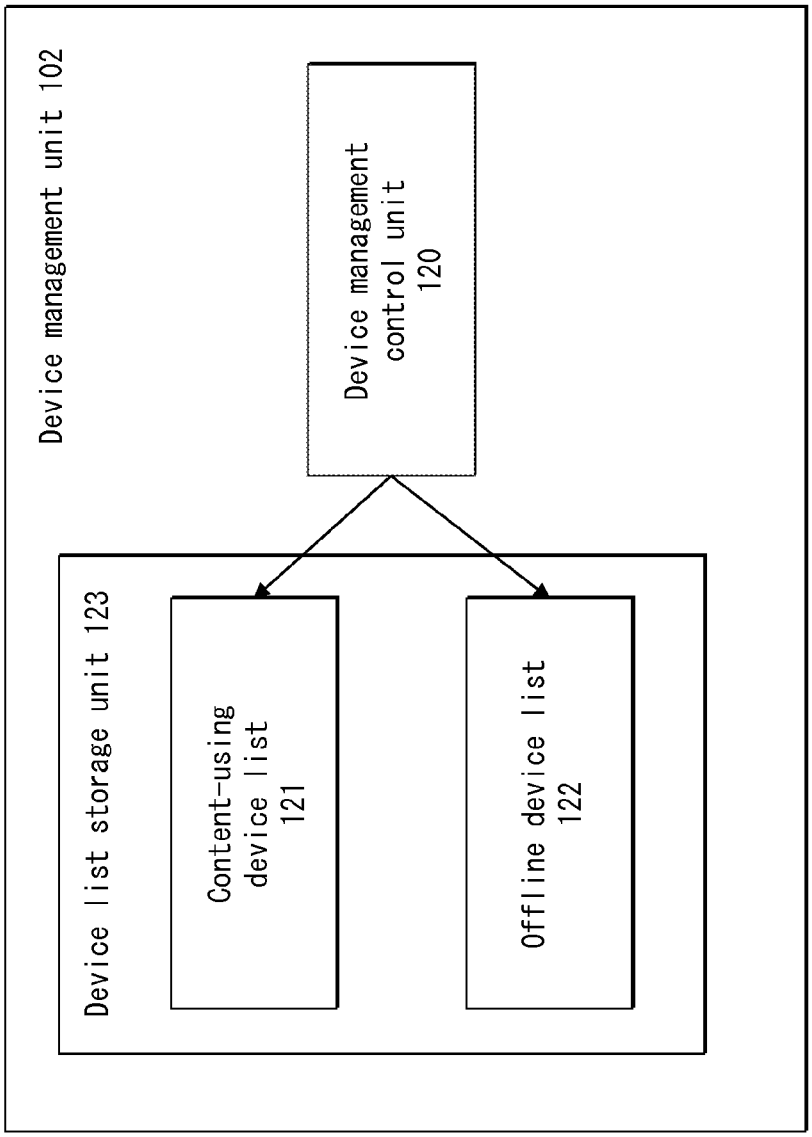

Device management unit 102
Device management control unit 120
Device list storage unit 123
Content-using device list 121
Offline device list 122

FIG. 5

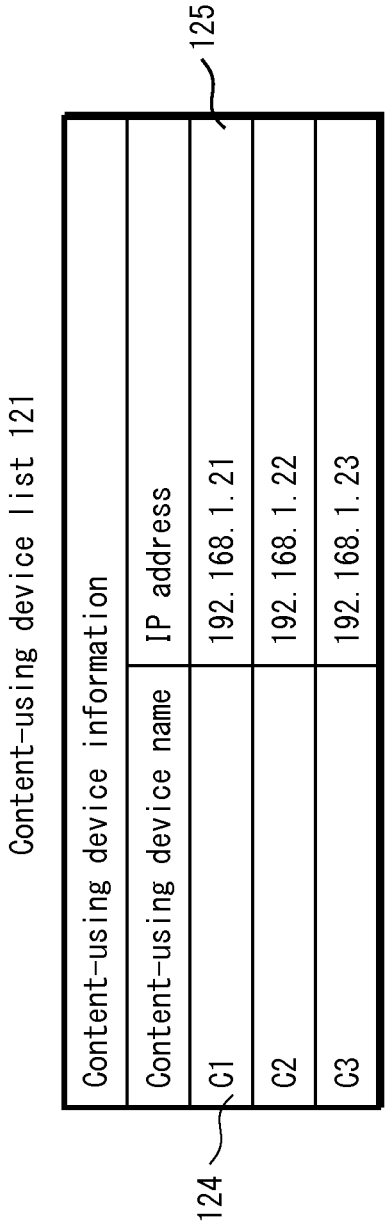

Content-using device list 121
125
124
Content-using device information
Content-using device name
IP address
C1
192.168.1.21
C2
192.168.1.22
C3
192.168.1.23

FIG. 6

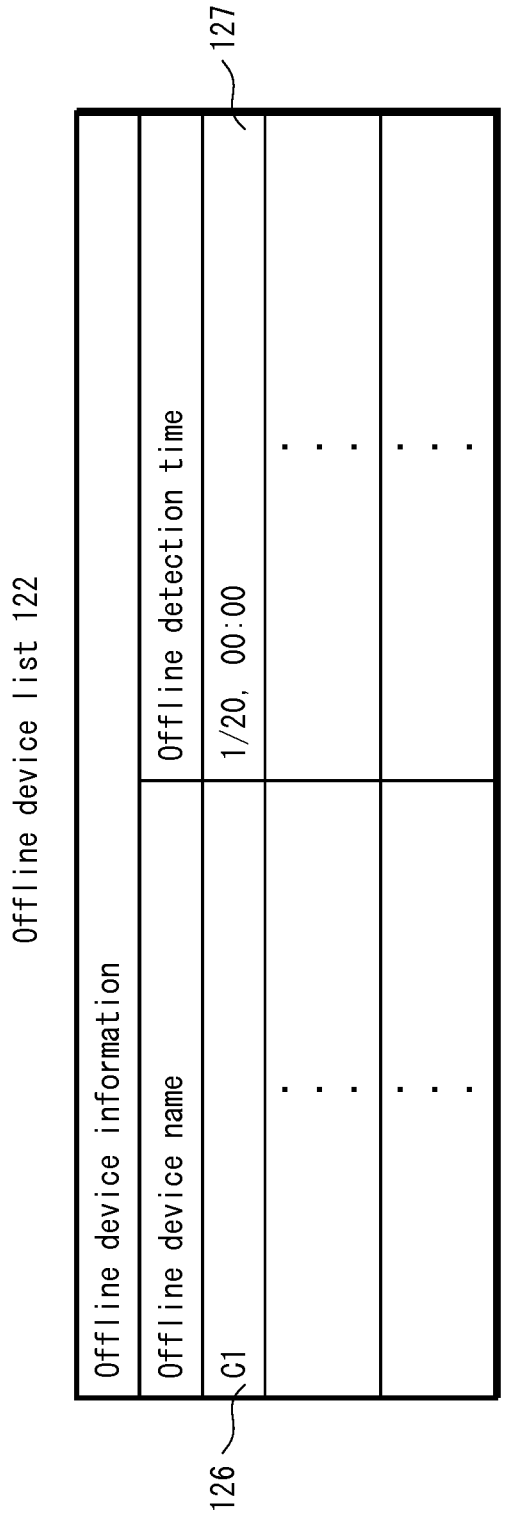

Offline device list 122
Offline device information
Offline device name
Offline detection time
C1
1/20, 00:00
126
127

FIG. 7

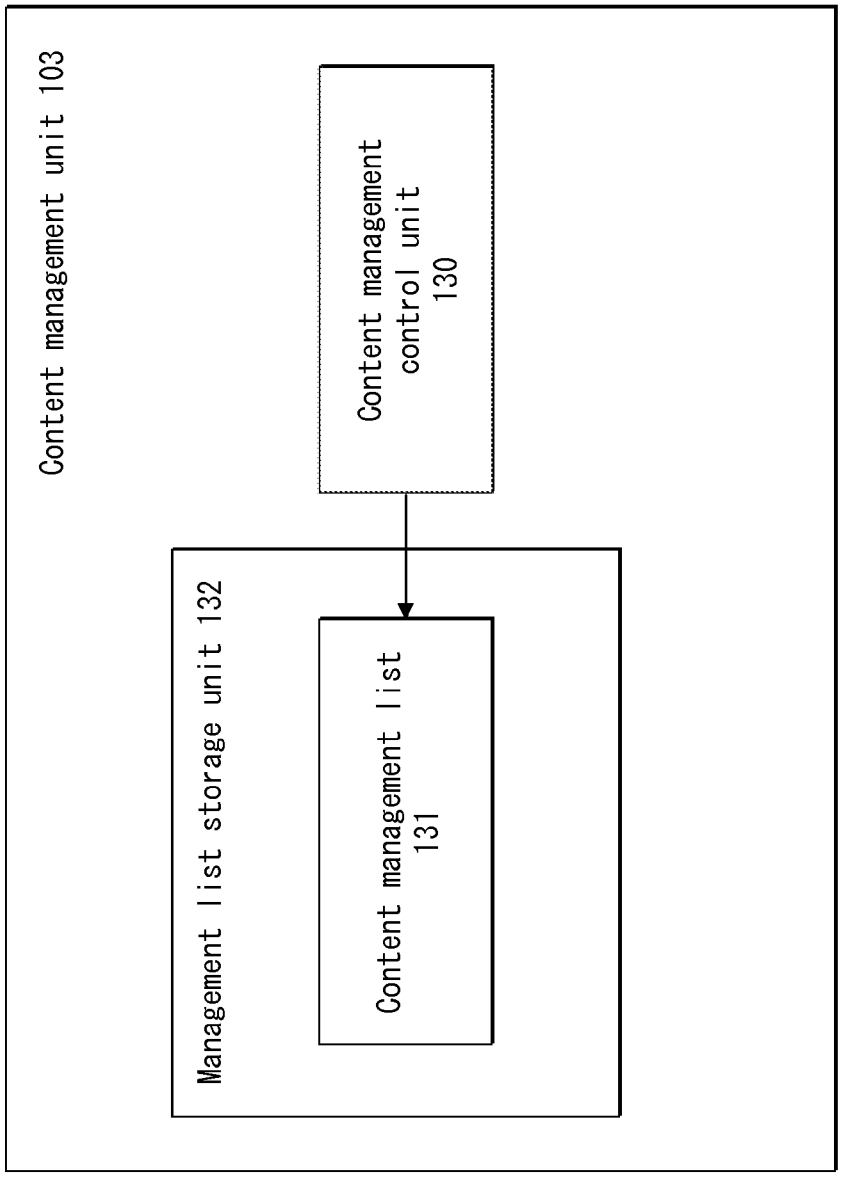
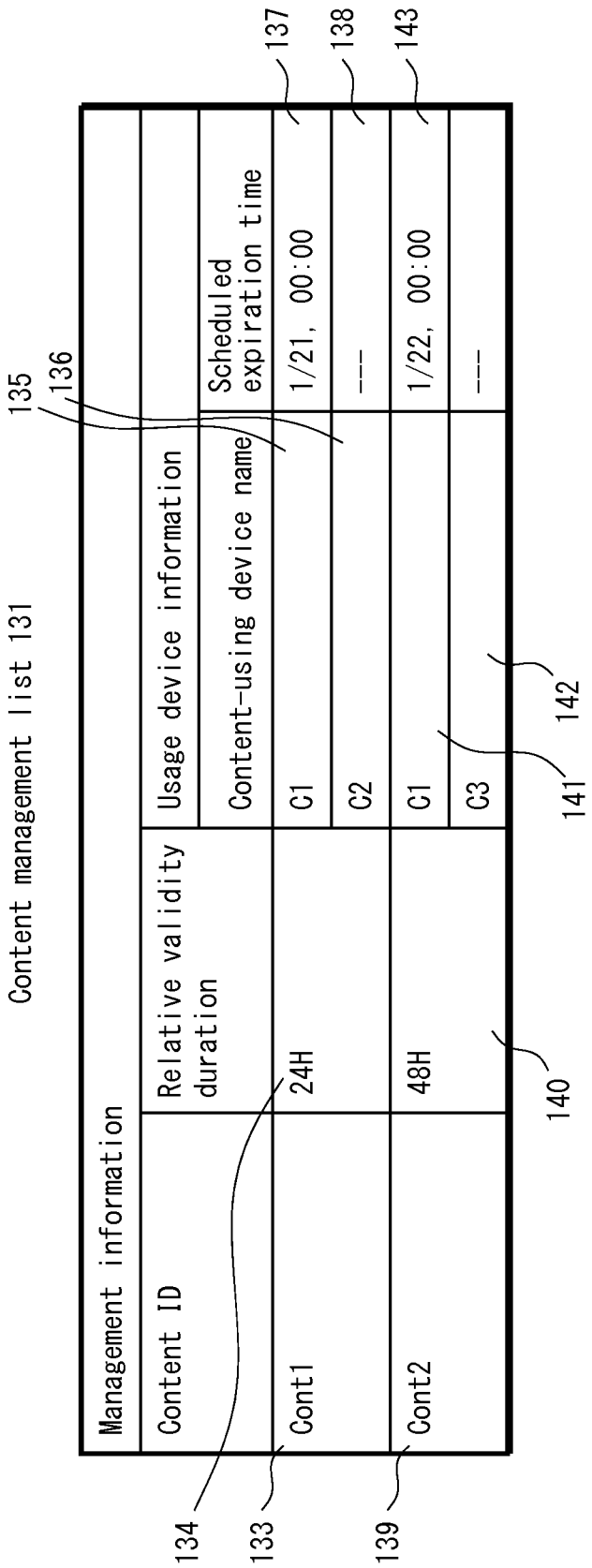

Content management unit 103
Content management control unit 130
Management list storage unit 132
Content management list 131

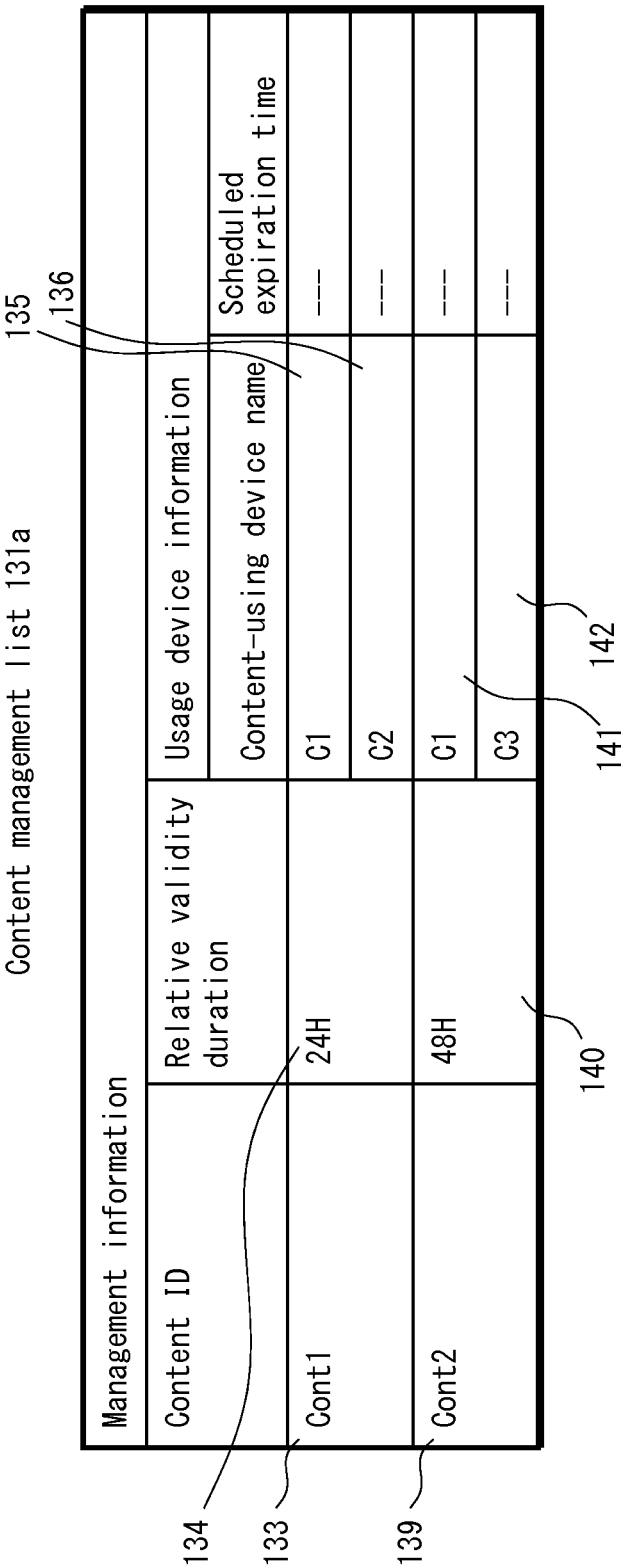
FIG. 8


Content management list 131
135
136
137
138
143
Management information
Content ID
Relative validity duration
Usage device information
Content-using device name
Scheduled expiration time
Cont1
24H
C1
1/21, 00:00
C2

Cont2
48H
C1
1/22, 00:00
C3

134
133
139
140
141
142

FIG. 9


Content management list 131a
135
136
Management information
Content ID
Relative validity duration
Usage device information
Content-using device name
Scheduled expiration time
Cont1
24H
C1

C2

Cont2
48H
C1

C3

134
133
139
140
141
142

FIG. 10

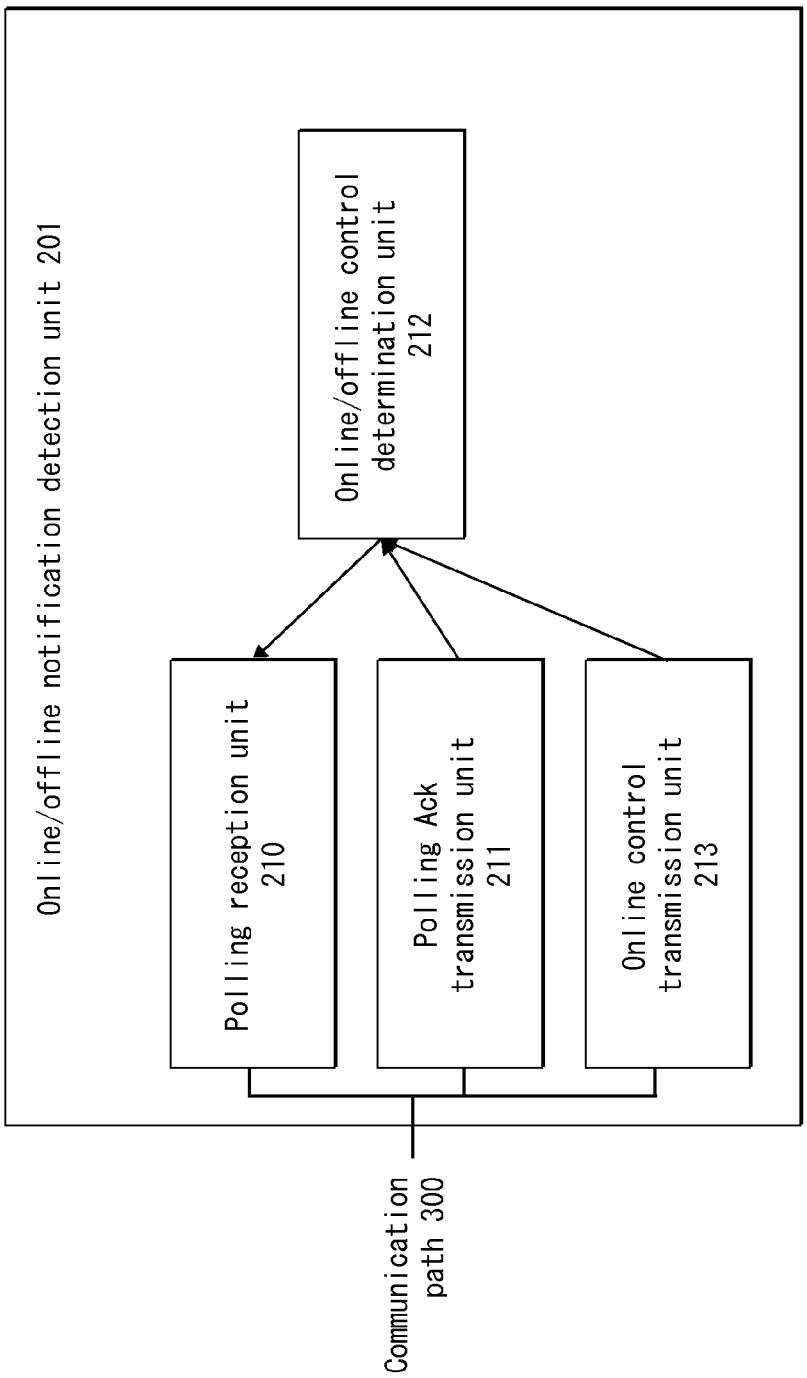

Online/offline notification detection unit 201
Online/offline control determination unit 212
Polling reception unit 210
Polling Ack transmission unit 211
Online control transmission unit 213
Communication path 300

FIG. 11

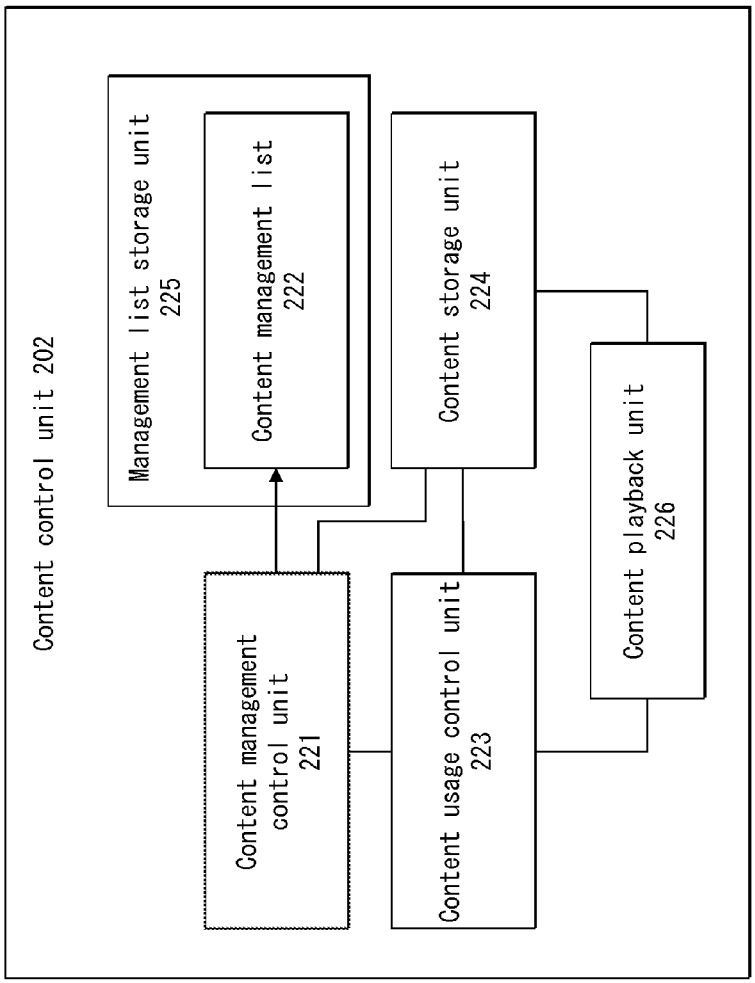

Content control unit 202
Management list storage unit 225
Content management list 222
Content storage unit 224
Content playback unit 226
Content management control unit 221
Content usage control unit 223

FIG. 12

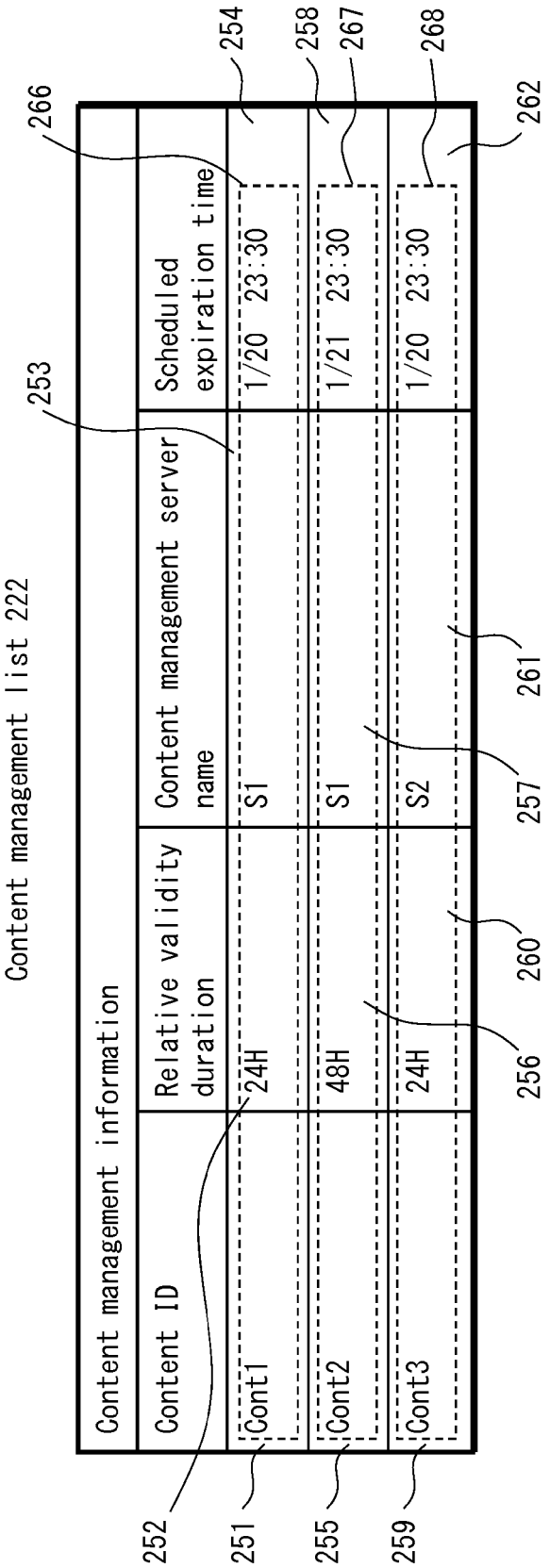

Content management list 222
Content management information
Content ID
Relative validity duration
Content management server name
Scheduled expiration time
Cont1
24H
S1
1/20 23:30
Cont2
48H
S1
1/21 23:30
Cont3
24H
S2
1/20 23:30
252
251
255
259
256
260
257
261
253
254
258
267
268
262
266

FIG. 13

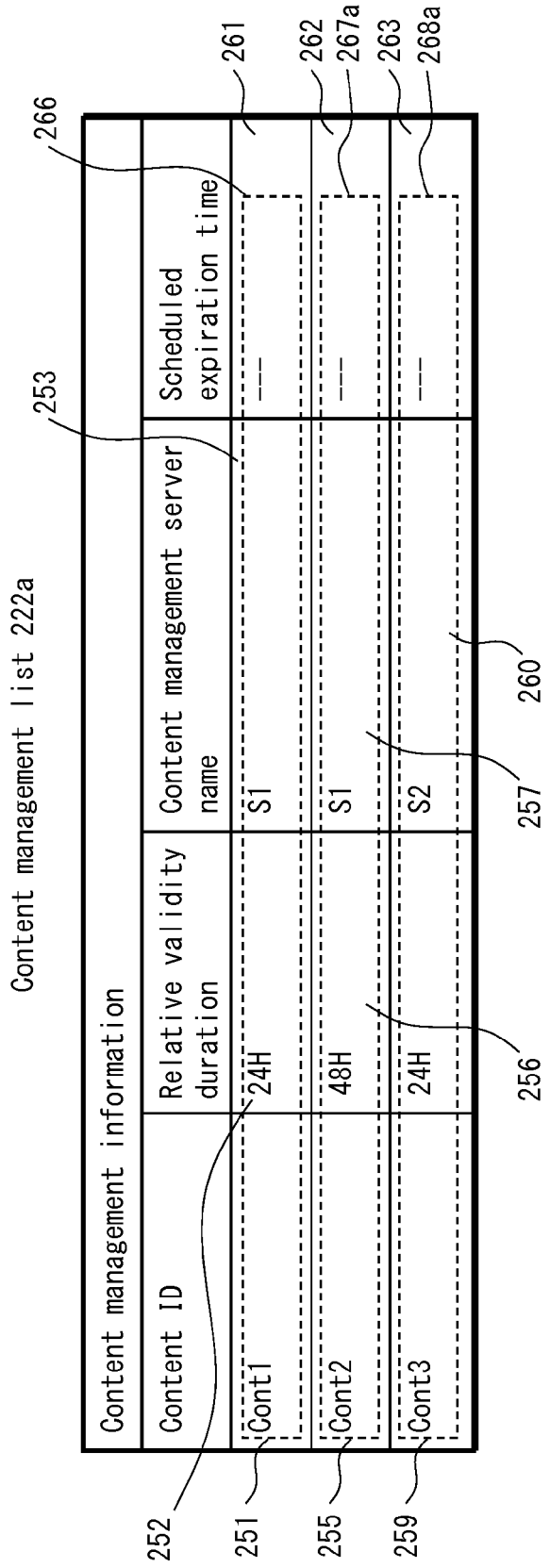

Content management list 222a
Content management information
Content ID
Relative validity duration
Content management server name
Scheduled expiration time
Cont1
24H
S1
--
Cont2
48H
S1
--
Cont3
24H
S2
--
252
251
255
259
256
257
260
253
266
261
262
267a
263
268a

FIG. 14

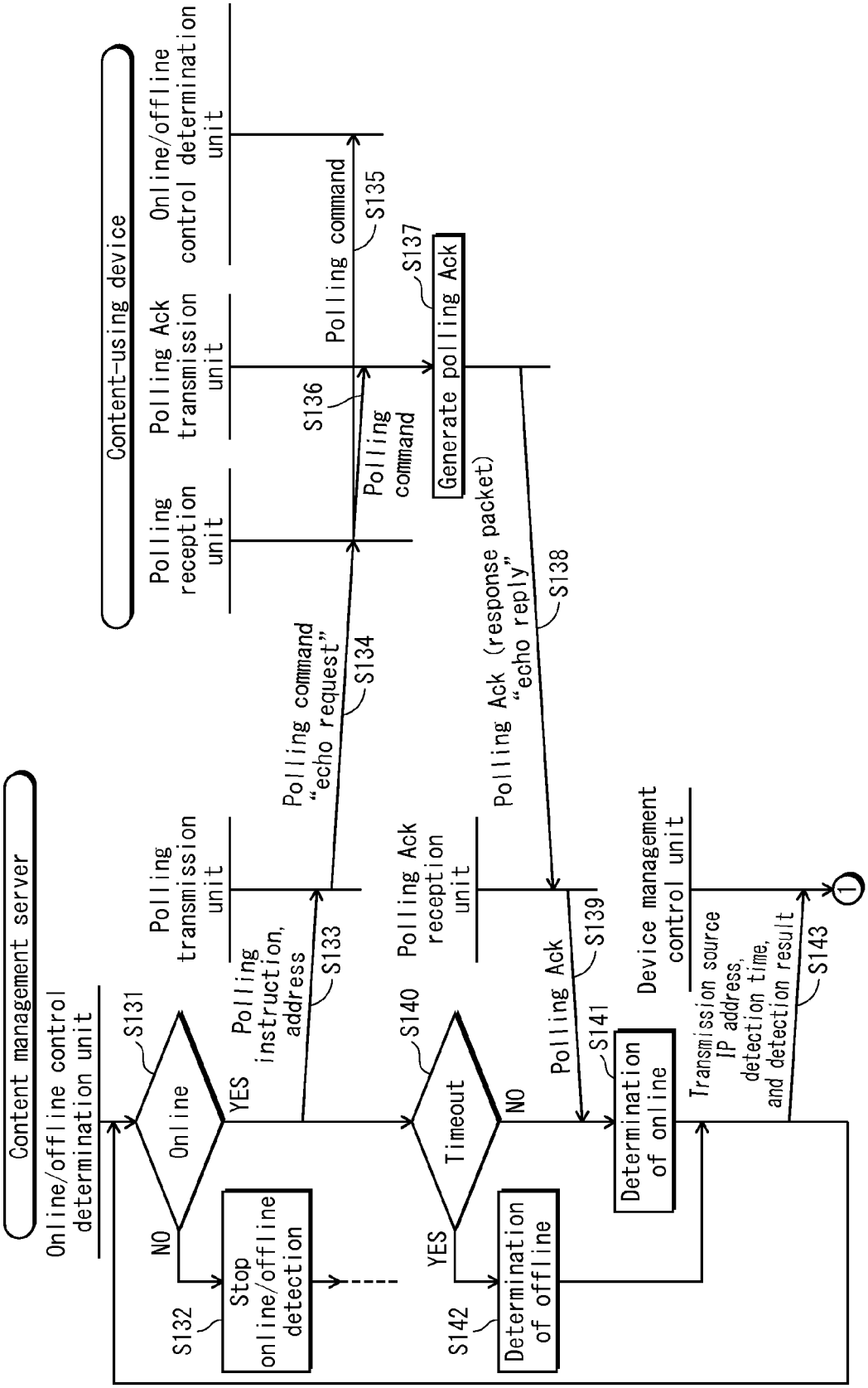

Content management server
Online/offline control determination unit
Online
YES
NO
S131
Polling transmission unit
Polling instruction, address
S133
Polling command "echo request"
S134
Content-using device
Polling reception unit
Polling Ack transmission unit
Online/offline control determination unit
S136
Polling command
Polling command
S135
S137
Generate polling Ack
Polling Ack (response packet) "echo reply"
S138
Polling Ack reception unit
S140
Timeout
YES
NO
Polling Ack
S139
S141
Determination of online
Device management control unit
Transmission source IP address, detection time, and detection result
S143
S132
Stop online/offline detection
S142
Determination of offline
1

FIG. 15

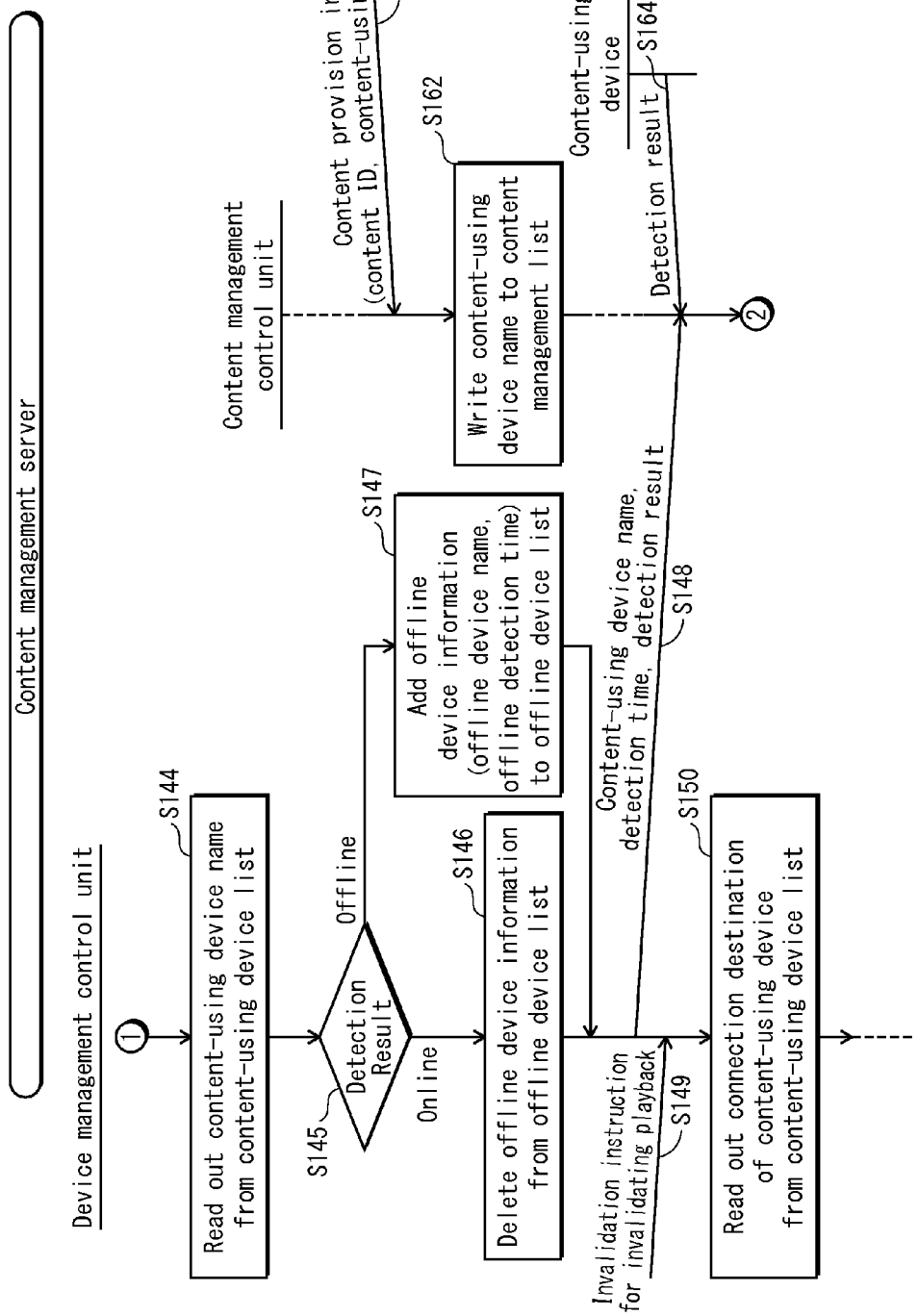

Content management server
Content management control unit
Device management control unit
Content provision information (content ID, content-using device name)
S161
S162
Write content-using device name to content management list
Content-using device
S164
Detection result
①
②
S144
Read out content-using device name from content-using device list
S145
Detection Result
Offline
Online
S146
Delete offline device information from offline device list
S147
Add offline device information (offline device name, offline detection time) to offline device list
Content-using device name, detection time, detection result
S148
Invalidation instruction for invalidating playback
S149
S150
Read out connection destination of content-using device from content-using device list

FIG. 16

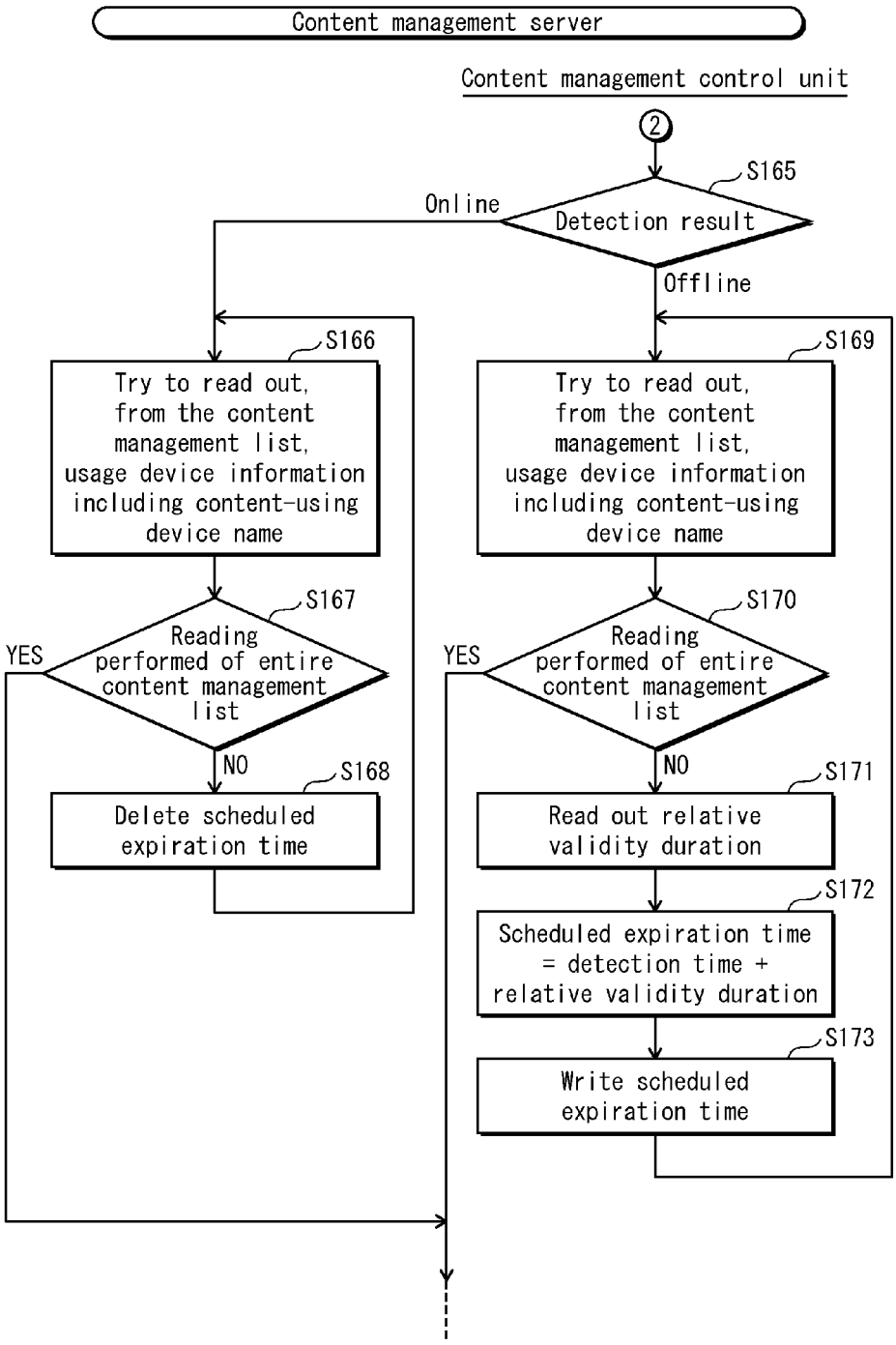

Content management server
Content management control unit
2
S165
Online
Detection result
Offline
S166
Try to read out, from the content management list, usage device information including content-using device name
S167
YES
Reading performed of entire content management list
NO
S168
Delete scheduled expiration time
S169
Try to read out, from the content management list, usage device information including content-using device name
S170
YES
Reading performed of entire content management list
NO
S171
Read out relative validity duration
S172
Scheduled expiration time = detection time + relative validity duration
S173
Write scheduled expiration time

FIG. 17

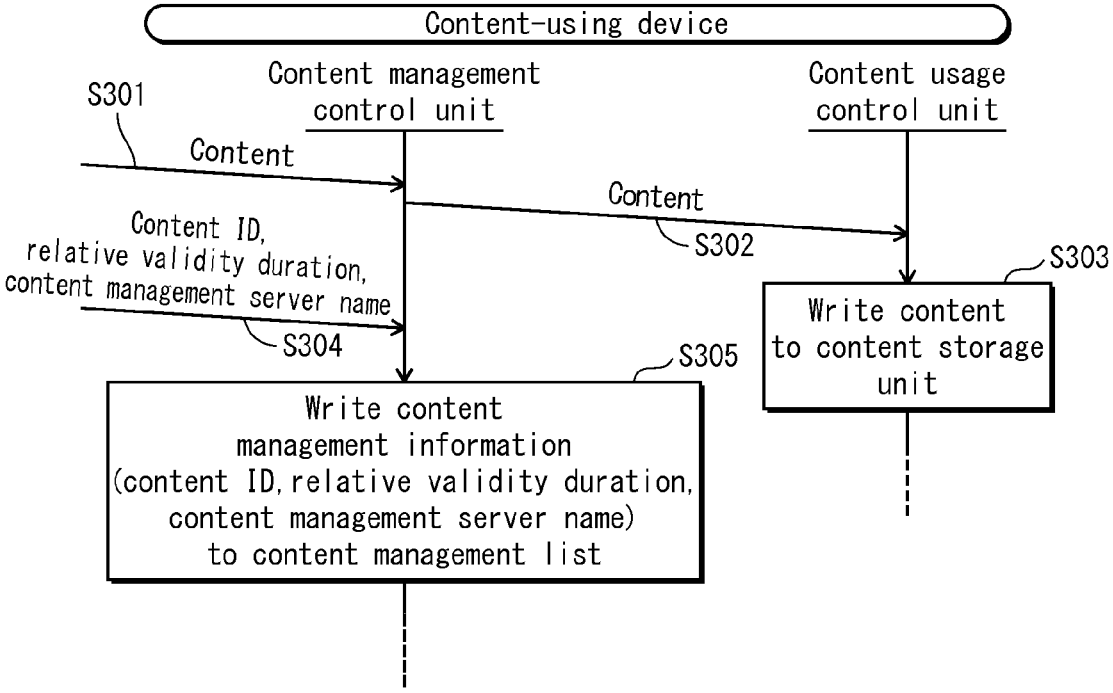

Content-using device
Content management control unit
Content usage control unit
S301
Content
Content
S302
S303
Content ID, relative validity duration, content management server name
S304
S305
Write content to content storage unit
Write content management information (content ID, relative validity duration, content management server name) to content management list

FIG. 18

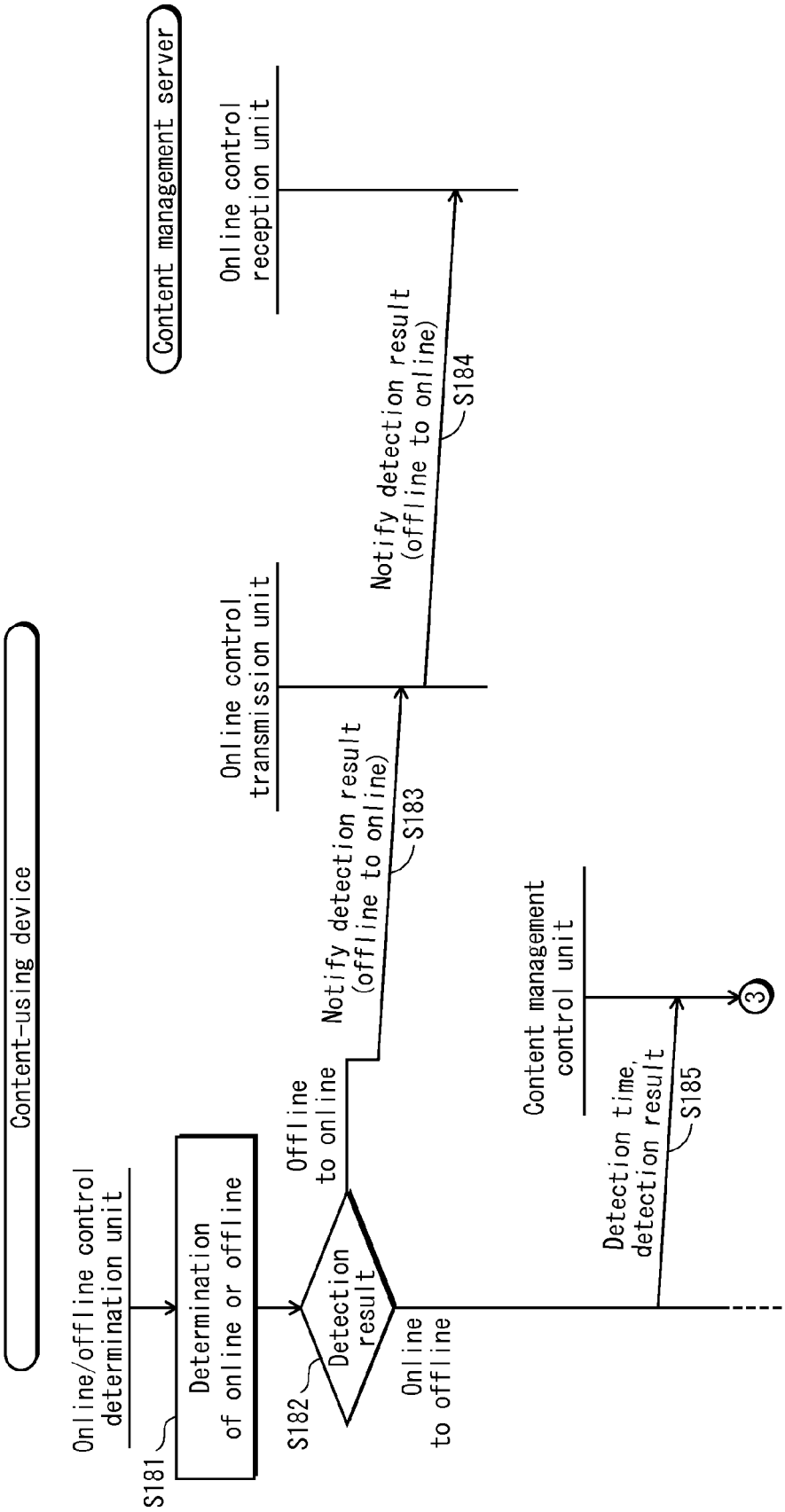

Content-using device
Content management server
Online/offline control determination unit
Determination of online or offline
S181
Detection result
S182
Offline to online
Online to offline
Online control transmission unit
Notify detection result (offline to online)
S183
Online control reception unit
Notify detection result (offline to online)
S184
Content management control unit
Detection time, detection result
S185
3

FIG. 19

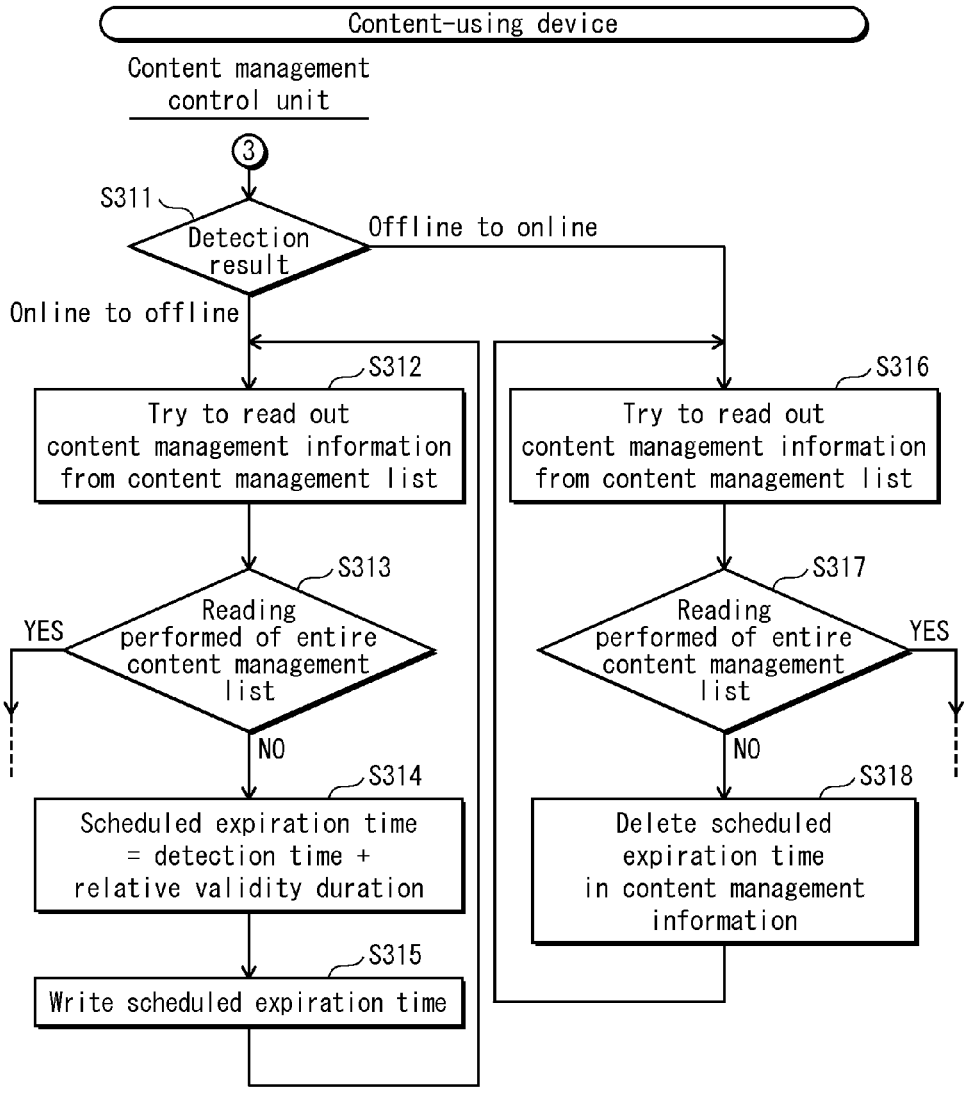

Content-using device
Content management control unit
3
S311
Detection result
Offline to online
Online to offline
S312
Try to read out content management information from content management list
S313
Reading performed of entire content management list
YES
NO
S314
Scheduled expiration time = detection time + relative validity duration
S315
Write scheduled expiration time
S316
Try to read out content management information from content management list
S317
Reading performed of entire content management list
YES
NO
S318
Delete scheduled expiration time in content management information

FIG. 20

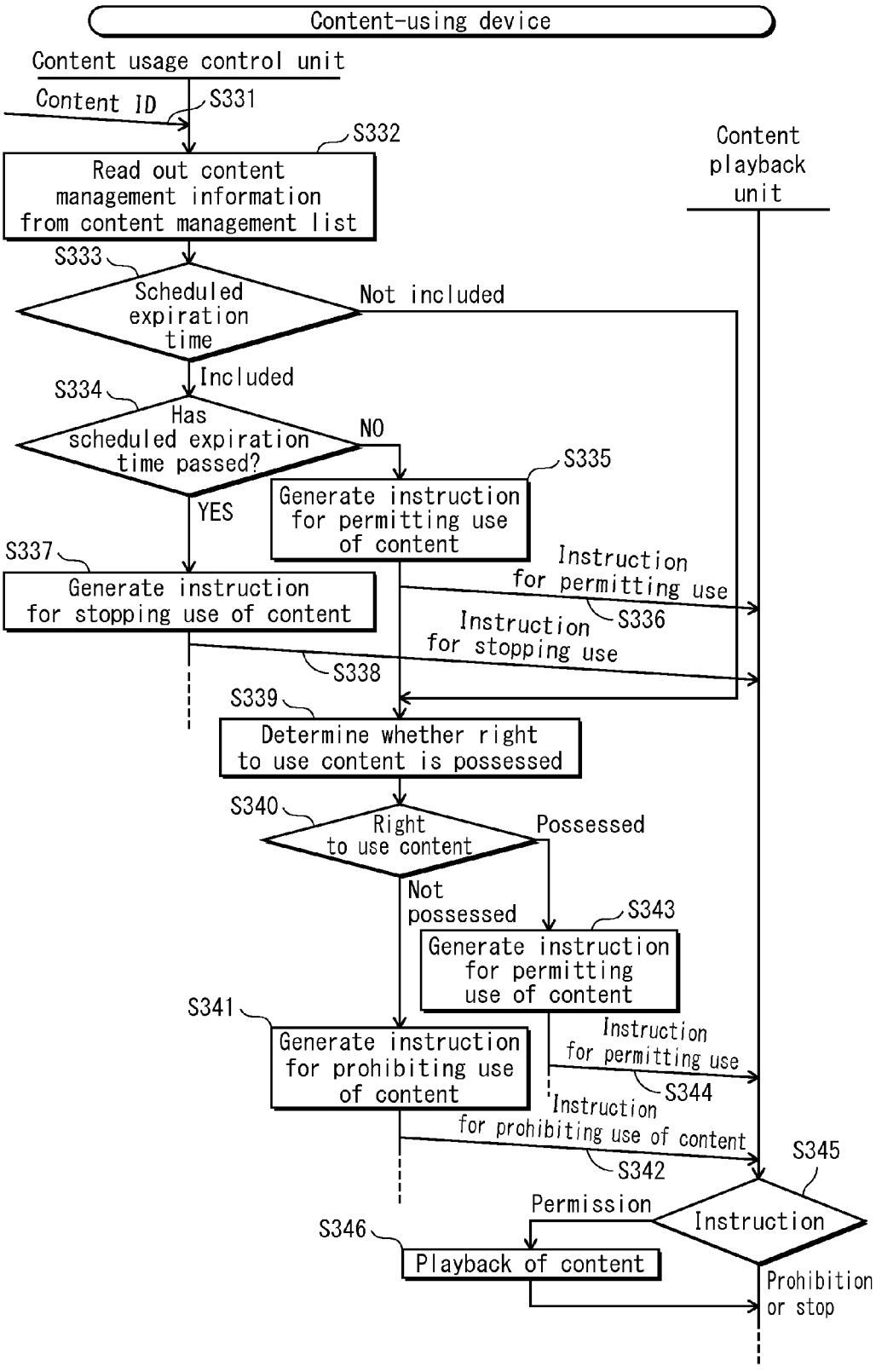

Content-using device
Content usage control unit
Content playback unit
Content ID
S331
S332
Read out content management information from content management list
S333
Scheduled expiration time
Not included
Included
S334
Has scheduled expiration time passed?
NO
YES
S335
Generate instruction for permitting use of content
S337
Generate instruction for stopping use of content
Instruction for permitting use
S336
Instruction for stopping use
S338
S339
Determine whether right to use content is possessed
S340
Right to use content
Possessed
Not possessed
S343
Generate instruction for permitting use of content
S341
Generate instruction for prohibiting use of content
Instruction for permitting use
S344
Instruction for prohibiting use of content
S342
S345
Instruction
Permission
S346
Playback of content
Prohibition or stop

FIG. 21

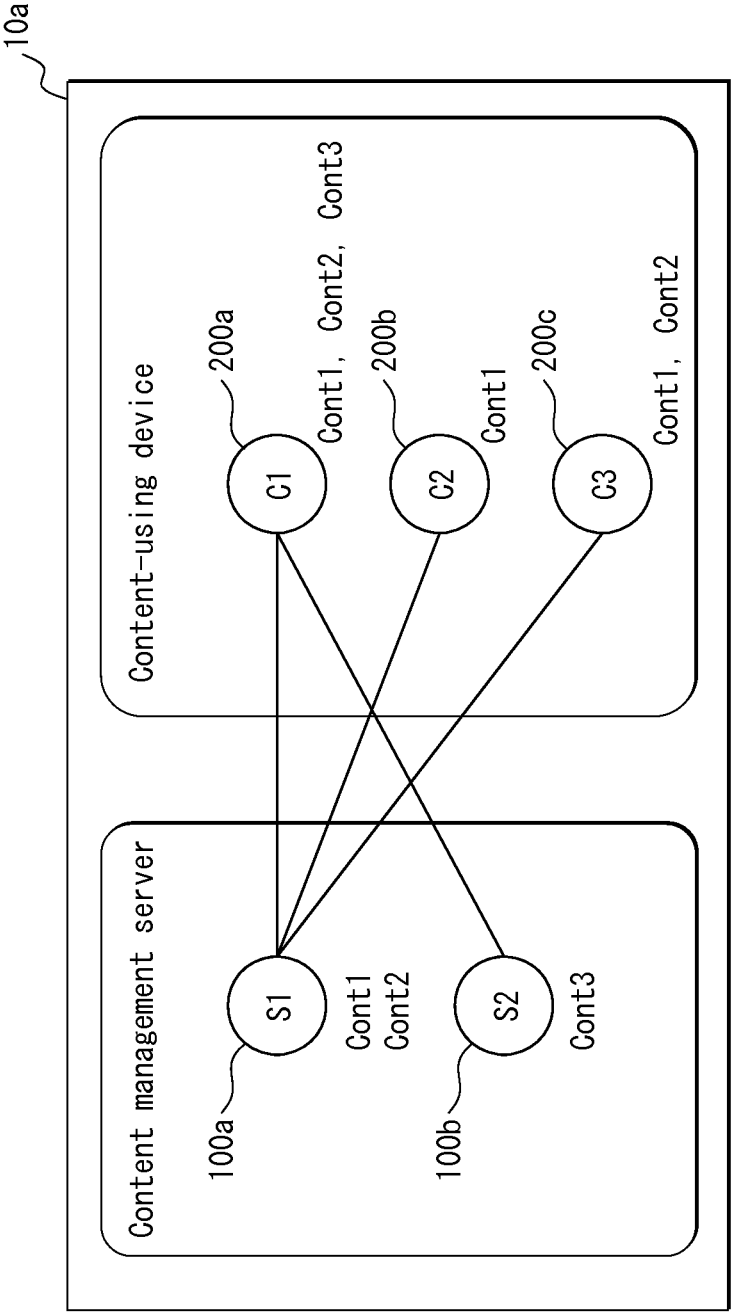

10a
Content-using device
200a
C1
Cont1, Cont2, Cont3
200b
C2
Cont1
200c
C3
Cont1, Cont2
Content management server
S1
Cont1
Cont2
100a
S2
Cont3
100b

FIG. 22

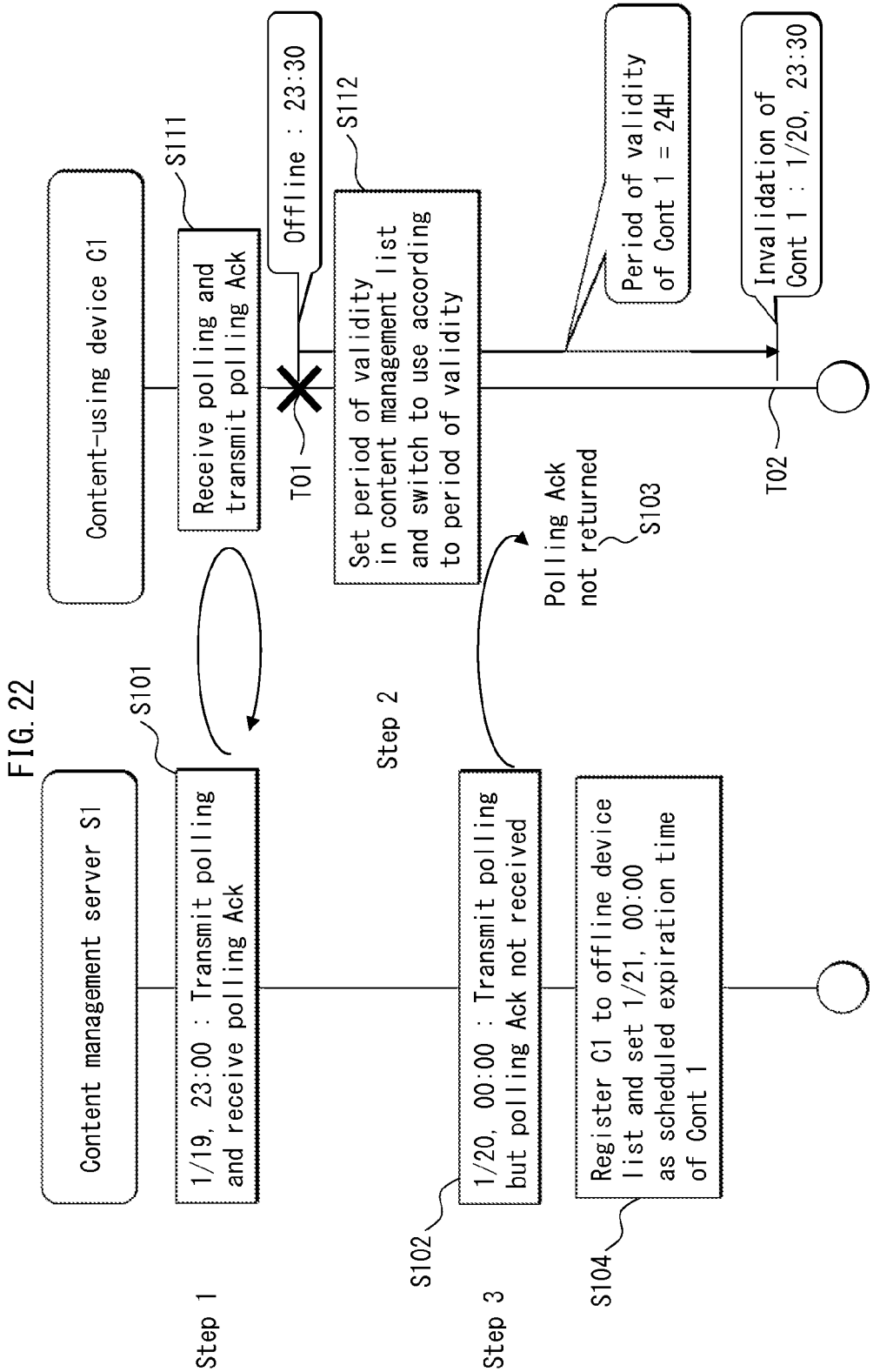

Content management server S1
Content-using device C1
S101
1/19, 23:00 : Transmit polling and receive polling Ack
S111
Receive polling and transmit polling Ack
Step 1
T01
Offline : 23:30
S112
Set period of validity in content management list and switch to use according to period of validity
Step 2
Polling Ack not returned
S103
S102
1/20, 00:00 : Transmit polling but polling Ack not received
Step 3
S104
Register C1 to offline device list and set 1/21, 00:00 as scheduled expiration time of Cont 1
Period of validity of Cont 1 = 24H
Invalidation of Cont 1 : 1/20, 23:30
T02

FIG. 23

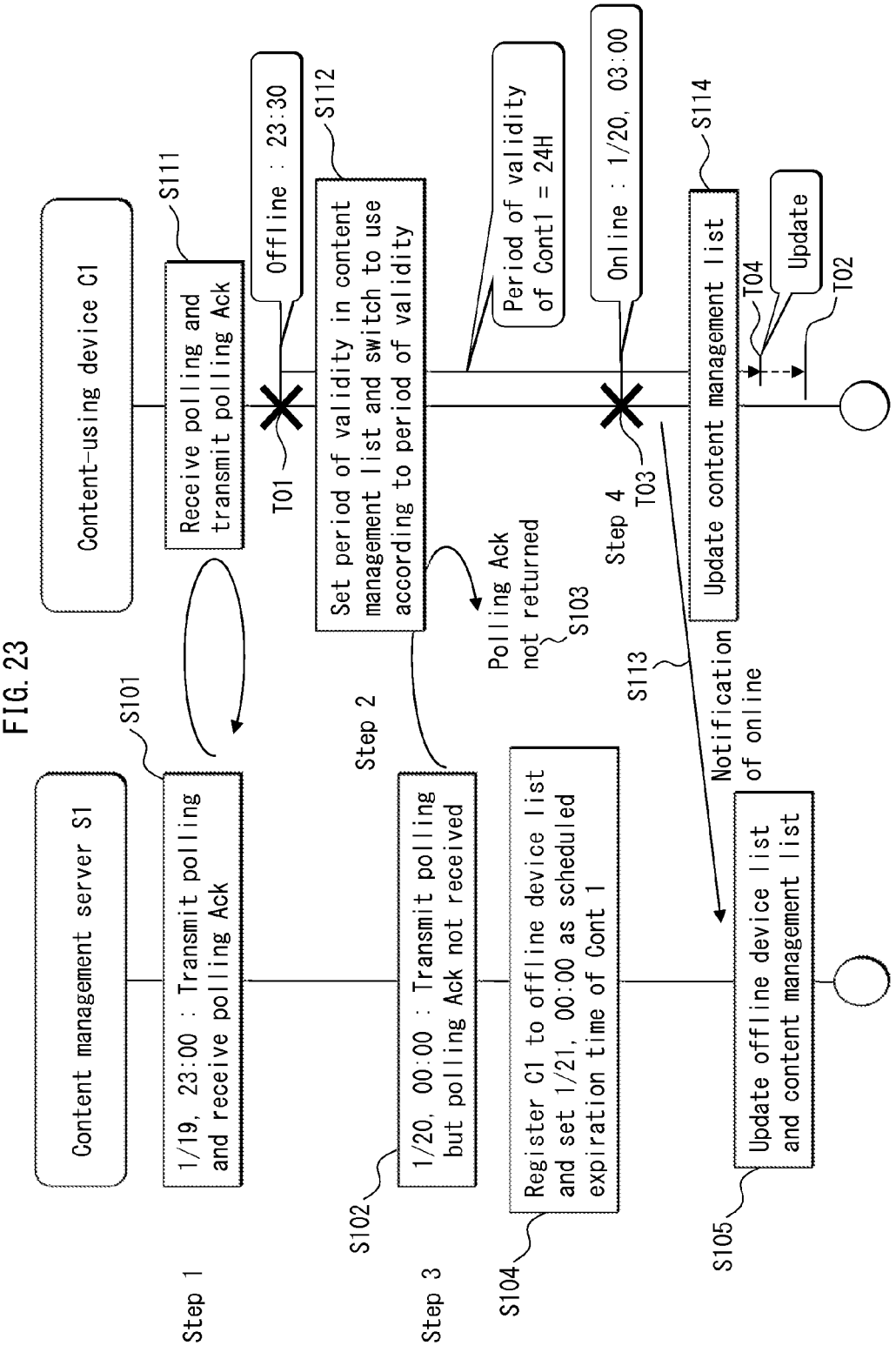

Content management server S1
Content-using device C1
S101
1/19, 23:00 : Transmit polling and receive polling Ack
S111
Receive polling and transmit polling Ack
Step 1
Offline : 23:30
T01
S112
Set period of validity in content management list and switch to use according to period of validity
Period of validity of Cont1 = 24H
Step 2
S102
1/20, 00:00 : Transmit polling but polling Ack not received
Polling Ack not returned
S103
Step 3
S104
Register C1 to offline device list and set 1/21, 00:00 as scheduled expiration time of Cont 1
Step 4
T03
Online : 1/20, 03:00
S113
Notification of online
S114
Update content management list
T04
Update
T02
S105
Update offline device list and content management list

FIG. 24

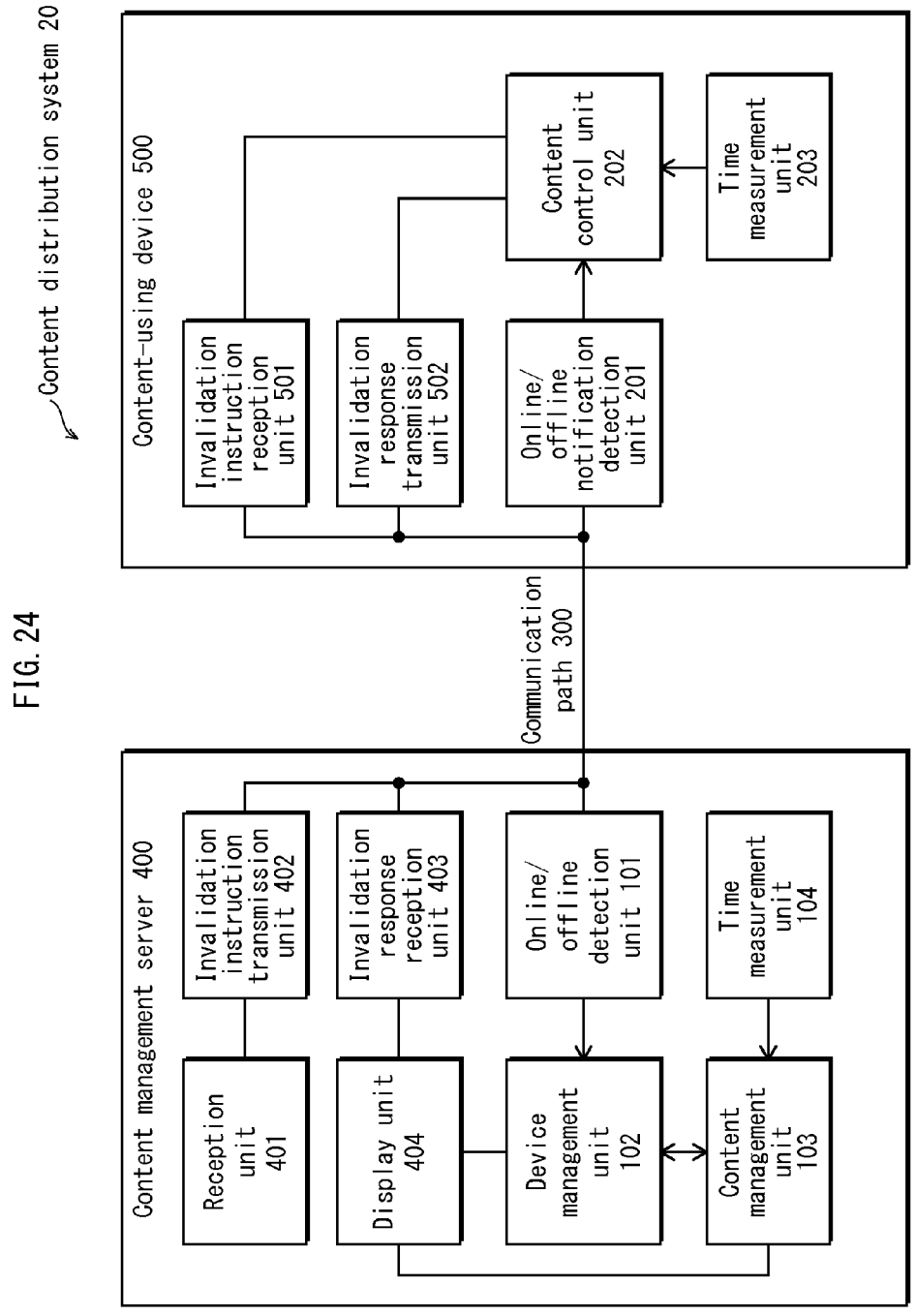

Content distribution system 20
Content-using device 500
Invalidation instruction reception unit 501
Invalidation response transmission unit 502
Online/offline notification detection unit 201
Content control unit 202
Time measurement unit 203
Communication path 300
Content management server 400
Invalidation instruction transmission unit 402
Invalidation response reception unit 403
Online/offline detection unit 101
Time measurement unit 104
Reception unit 401
Display unit 404
Device management unit 102
Content management unit 103

FIG. 25

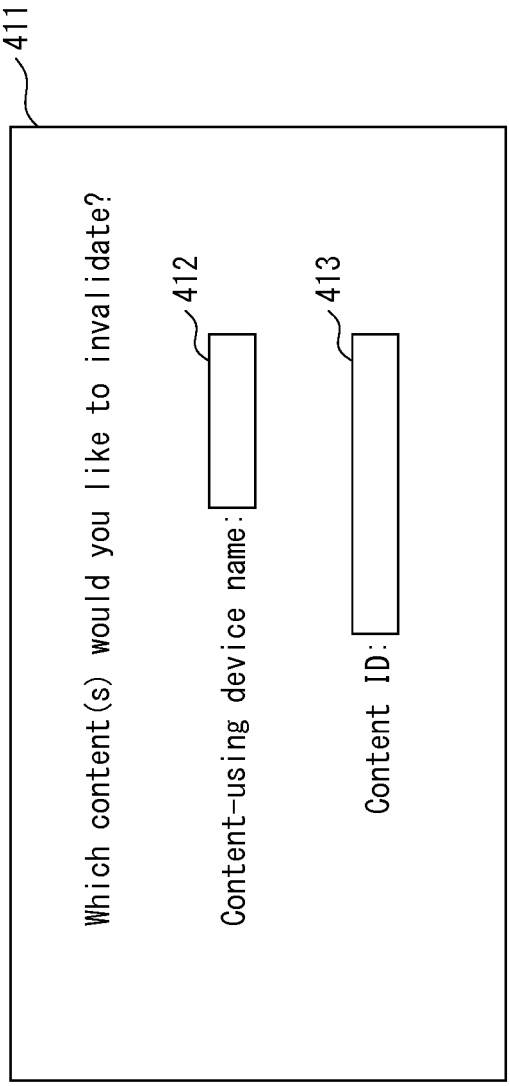

411
Which content(s) would you like to invalidate?
412
Content-using device name:
413
Content ID:

FIG. 26

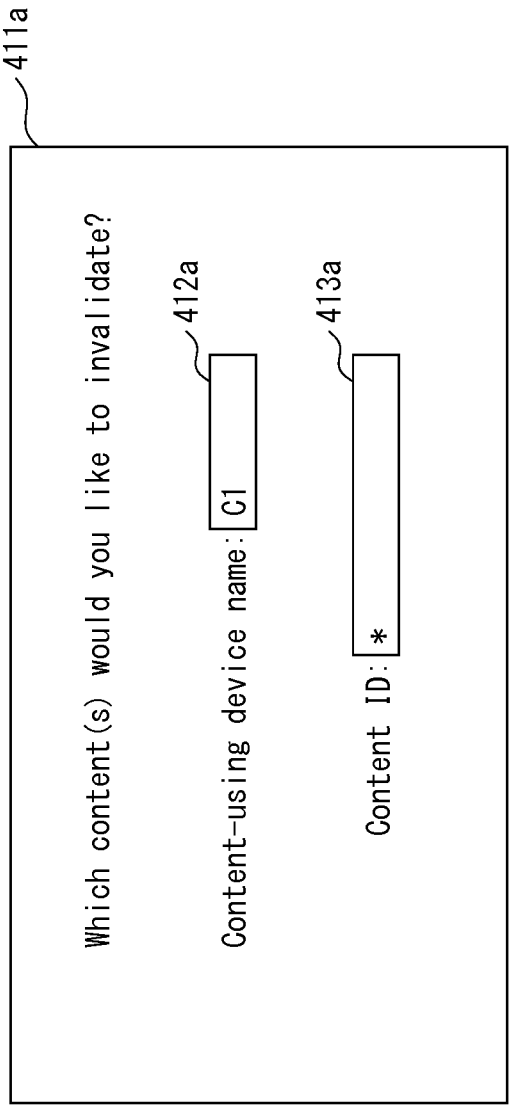

411a
Which content(s) would you like to invalidate?
412a
Content-using device name: C1
413a
Content ID: *

FIG. 27

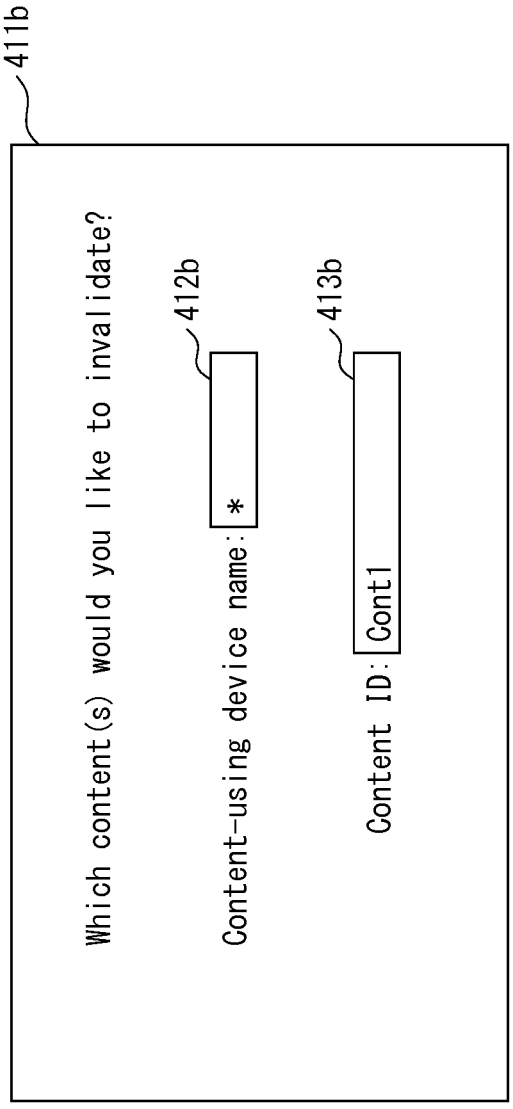

411b
Which content(s) would you like to invalidate?
412b
Content-using device name: *
413b
Content ID: Cont1

FIG. 28

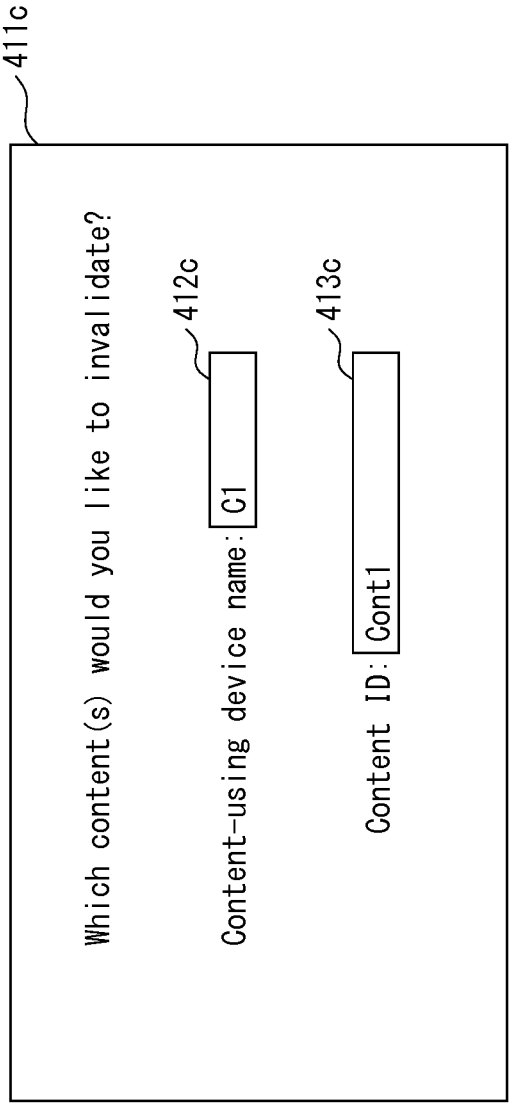

411c
Which content(s) would you like to invalidate?
412c
Content-using device name: C1
413c
Content ID: Cont1

FIG. 29

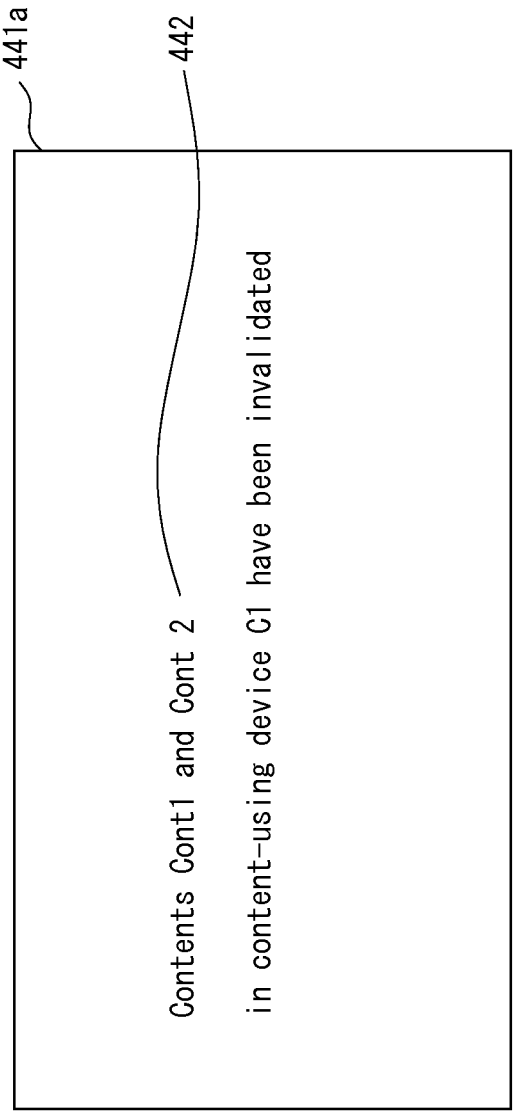

441a
442
Contents Cont1 and Cont 2
in content-using device C1 have been invalidated

FIG. 30

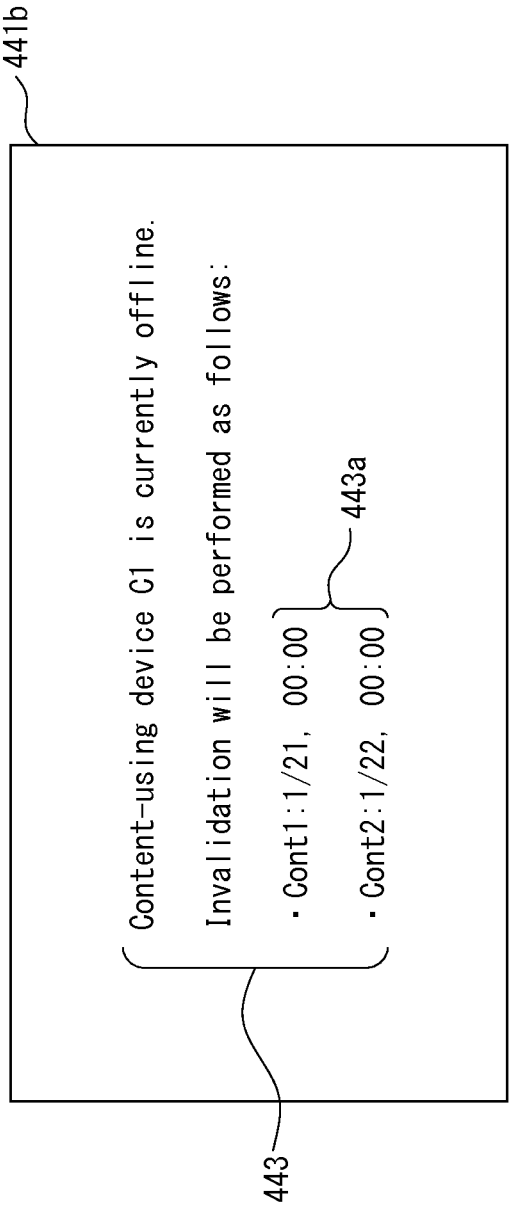

441b
Content-using device C1 is currently offline.
Invalidation will be performed as follows:
・Cont1:1/21, 00:00
・Cont2:1/22, 00:00
443a
443

FIG. 31

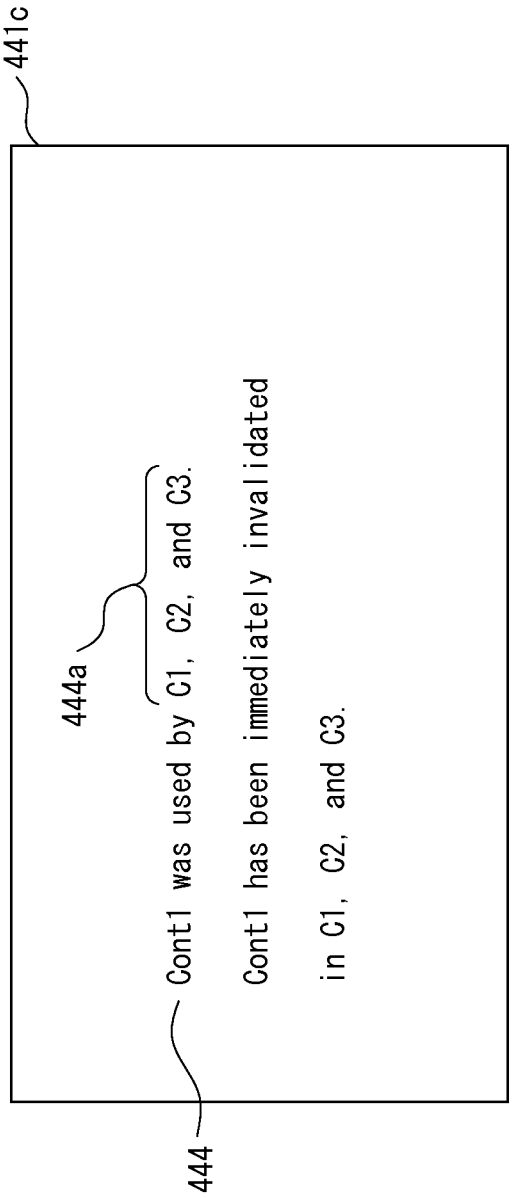

441c
444a
Cont1 was used by C1, C2, and C3.
Cont1 has been immediately invalidated
in C1, C2, and C3.
444

FIG. 32

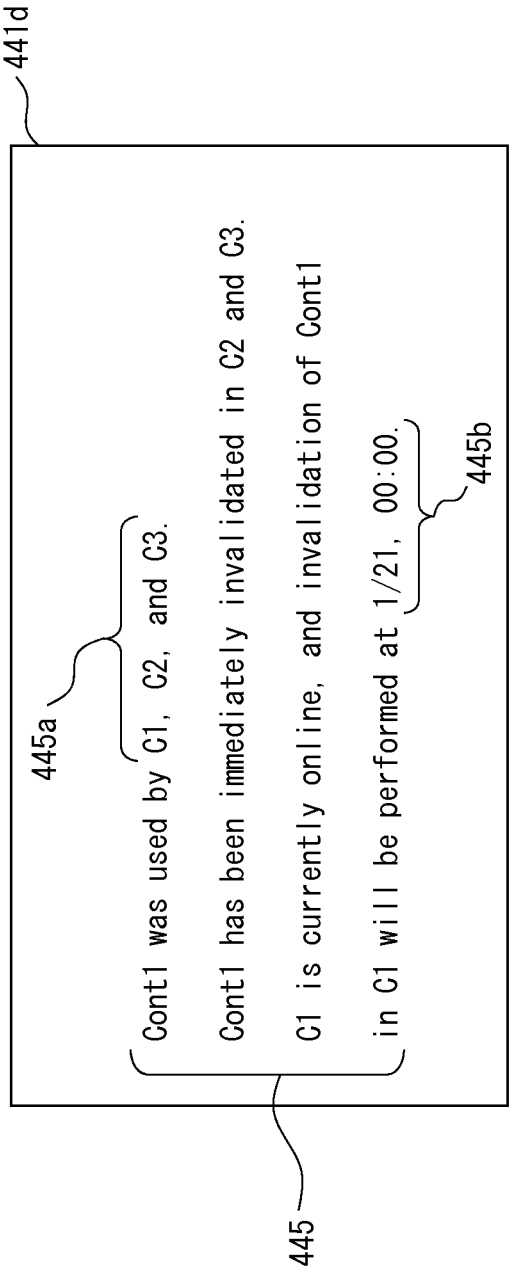

441d
445a
Cont1 was used by C1, C2, and C3.
Cont1 has been immediately invalidated in C2 and C3.
C1 is currently online, and invalidation of Cont1
in C1 will be performed at 1/21, 00:00.
445b
445

FIG. 33

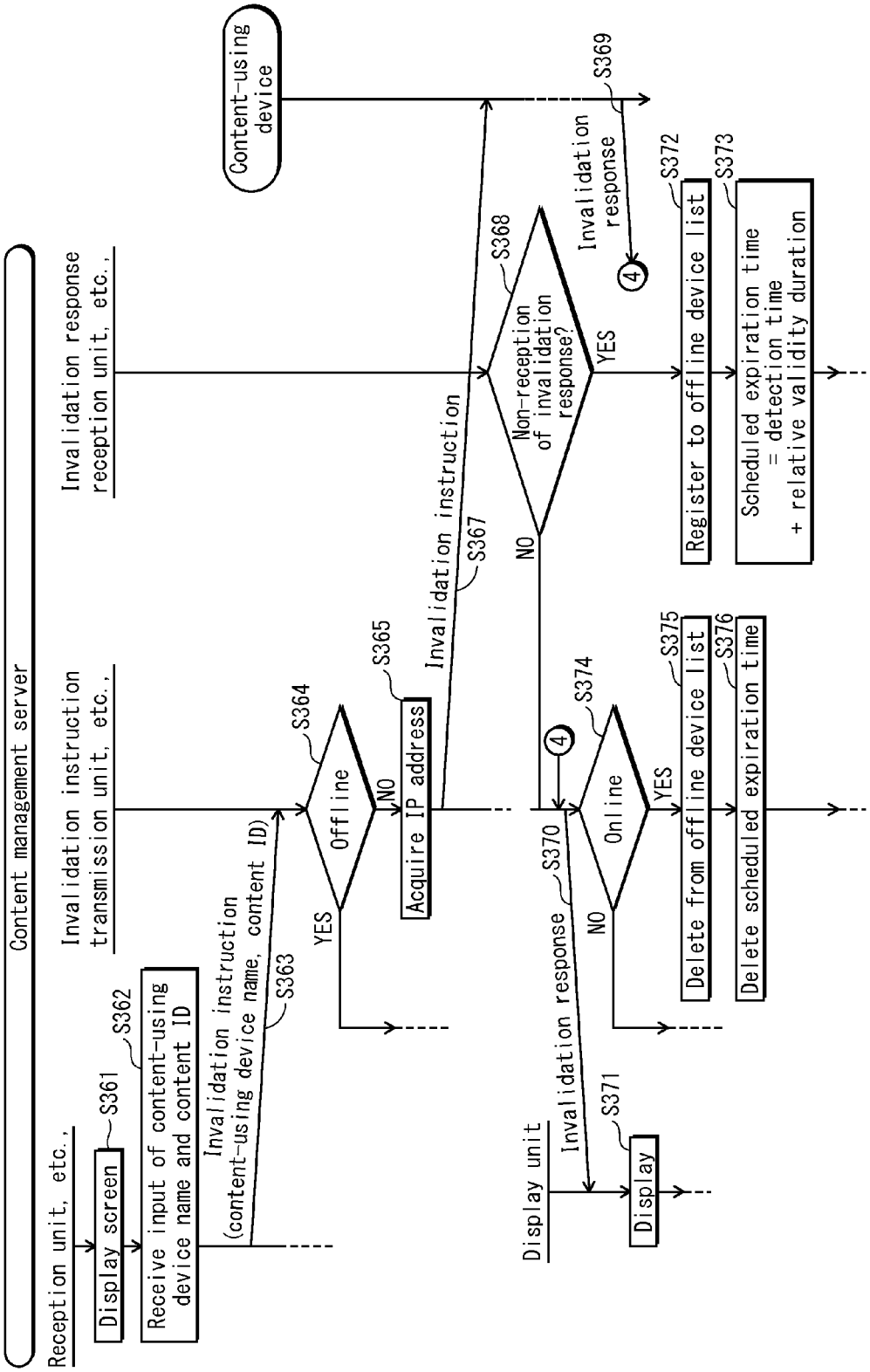

Content management server
Reception unit, etc.
Display screen
S361
Receive input of content-using device name and content ID
S362
Invalidation instruction transmission unit, etc.
Invalidation instruction (content-using device name, content ID)
S363
Offline
S364
YES
NO
Acquire IP address
S365
Invalidation instruction
S367
Invalidation response reception unit, etc.
Content-using device
Non-reception of invalidation response?
S368
YES
NO
Invalidation response
S369
Register to offline device list
S372
Scheduled expiration time = detection time + relative validity duration
S373
Display unit
Invalidation response
S370
Online
S374
YES
NO
Delete from offline device list
S375
Delete scheduled expiration time
S376
Display
S371

FIG. 34

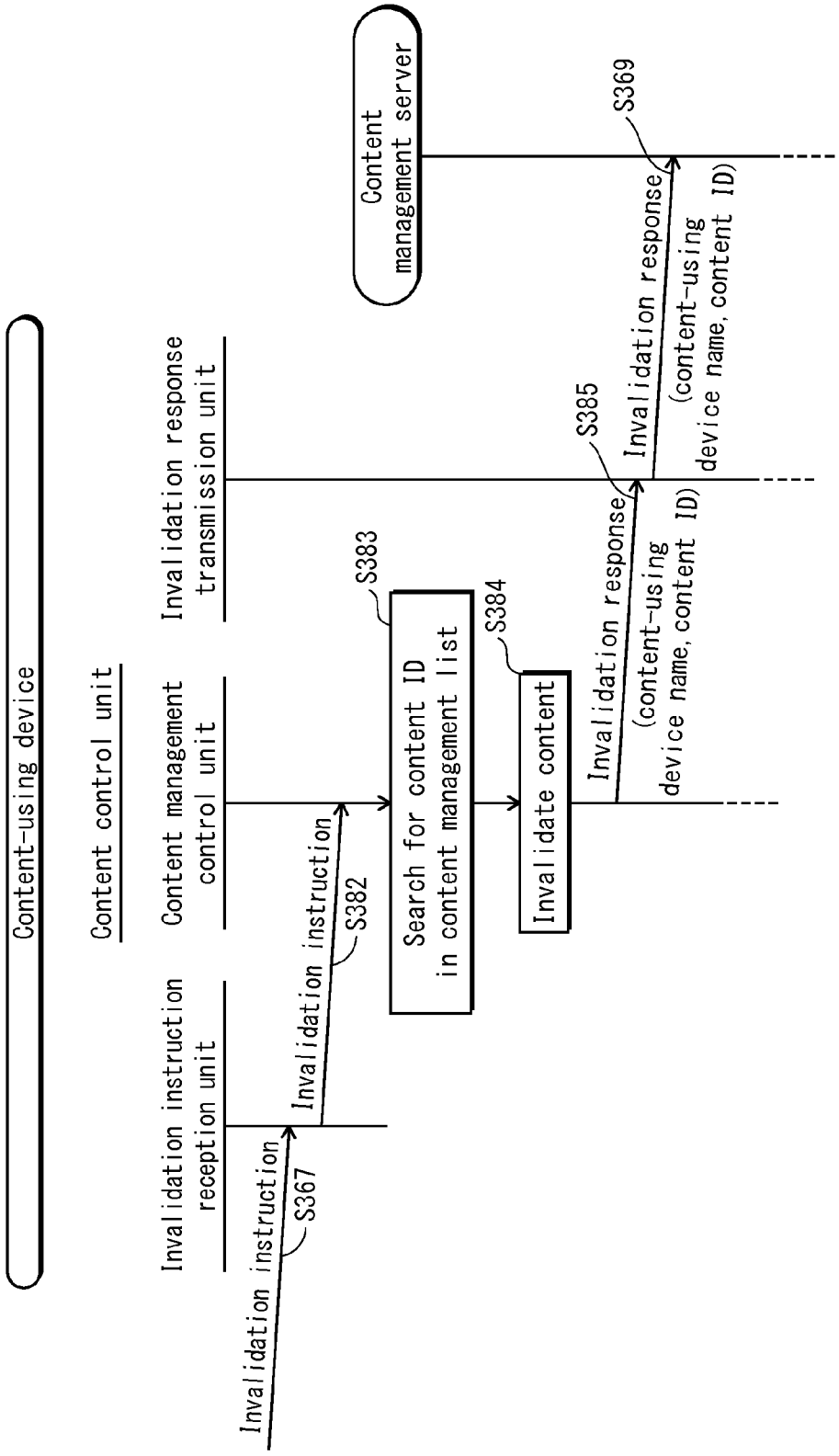

Content-using device
Content control unit
Invalidation instruction reception unit
Content management control unit
Invalidation response transmission unit
Content management server
Invalidation instruction
S367
Invalidation instruction
S382
Search for content ID in content management list
S383
Invalidate content
S384
Invalidation response (content-using device name, content ID)
S385
Invalidation response (content-using device name, content ID)
S369

FIG. 35

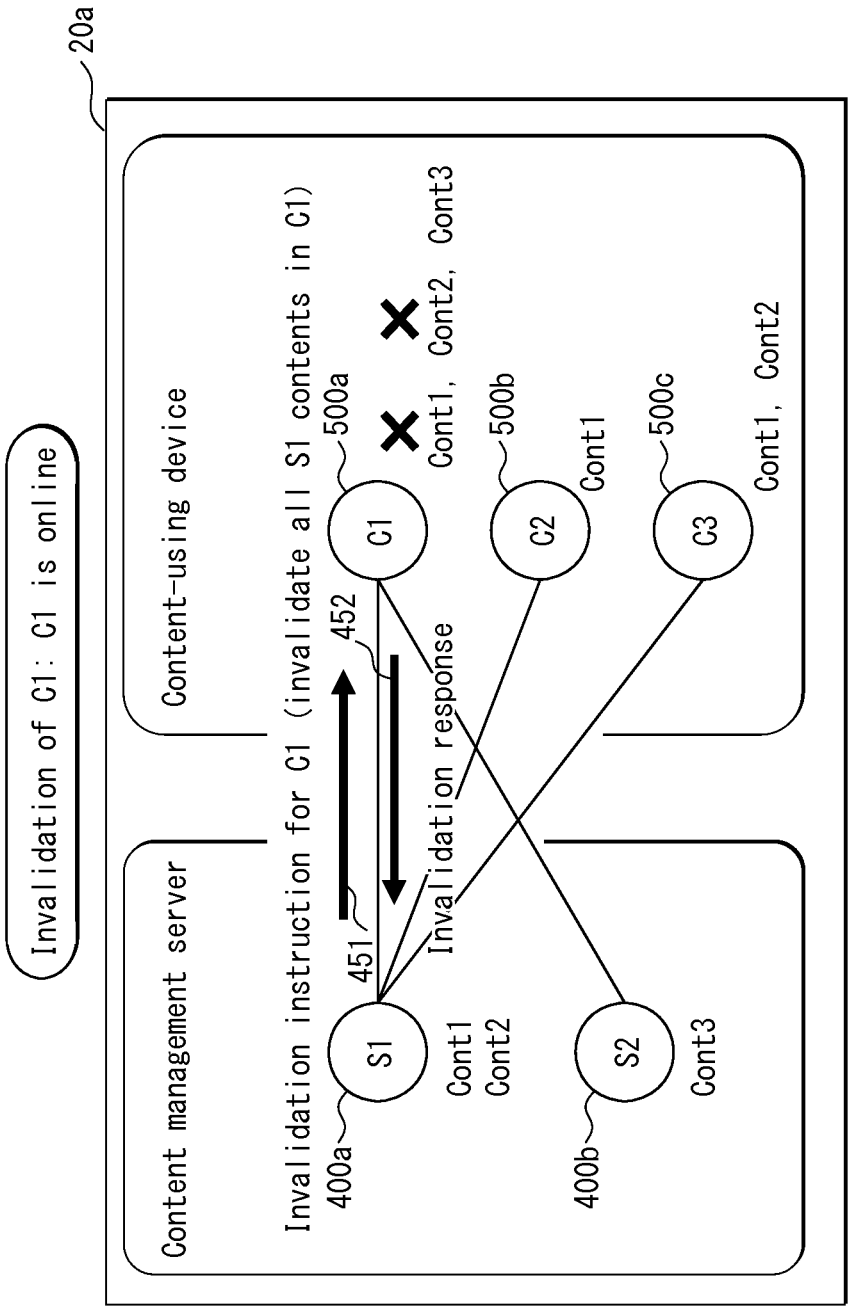

Invalidation of C1: C1 is online
20a
Content management server
Content-using device
Invalidation instruction for C1 (invalidate all S1 contents in C1)
451
452
Invalidation response
400a
S1
Cont1
Cont2
400b
S2
Cont3
500a
C1
Cont1, Cont2, Cont3
500b
C2
Cont1
500c
C3
Cont1, Cont2

FIG. 36

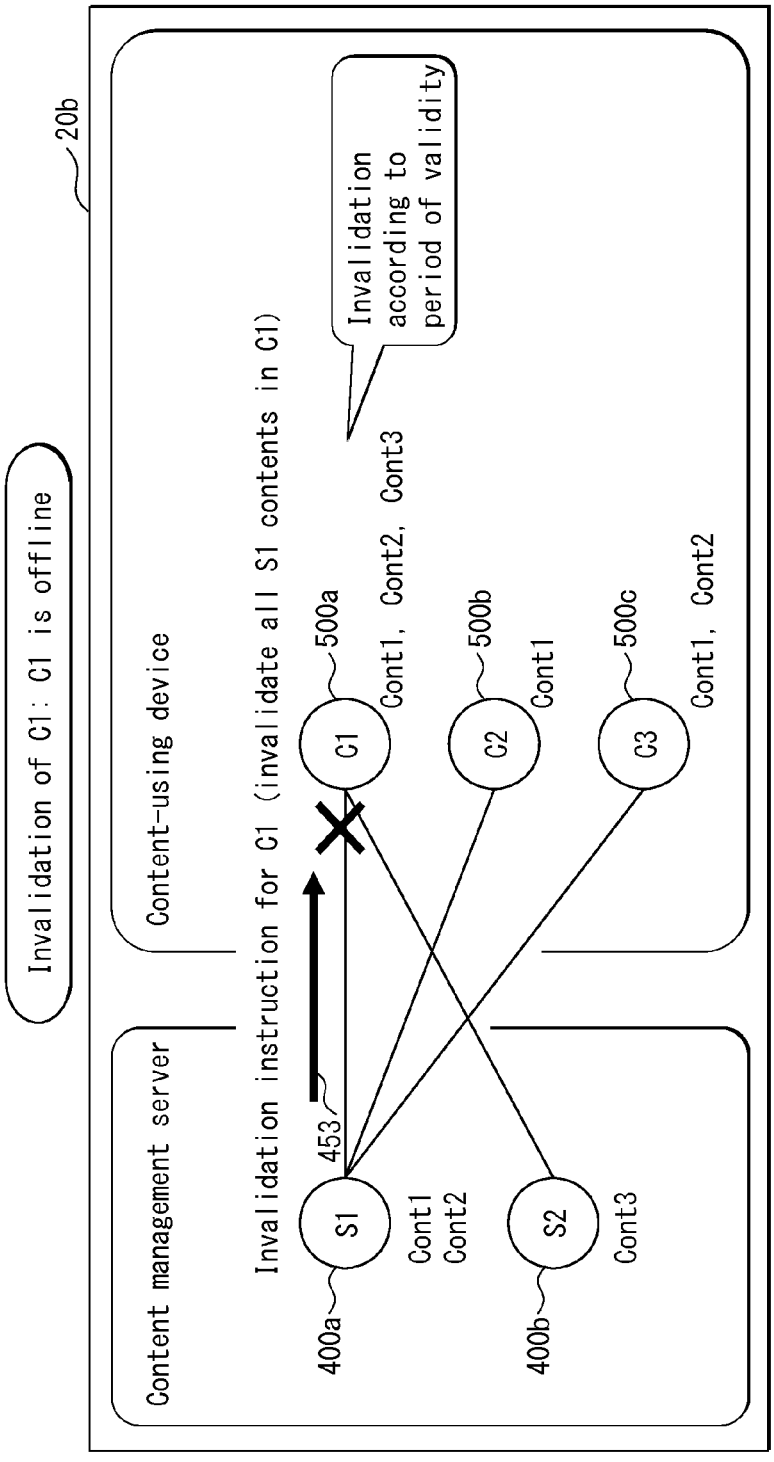

Invalidation of C1: C1 is offline
20b
Content-using device
Content management server
Invalidation instruction for C1 (invalidate all S1 contents in C1)
453
Invalidation according to period of validity
C1
500a
Cont1, Cont2, Cont3
C2
500b
Cont1
C3
500c
Cont1, Cont2
S1
Cont1
Cont2
400a
S2
Cont3
400b

FIG. 37

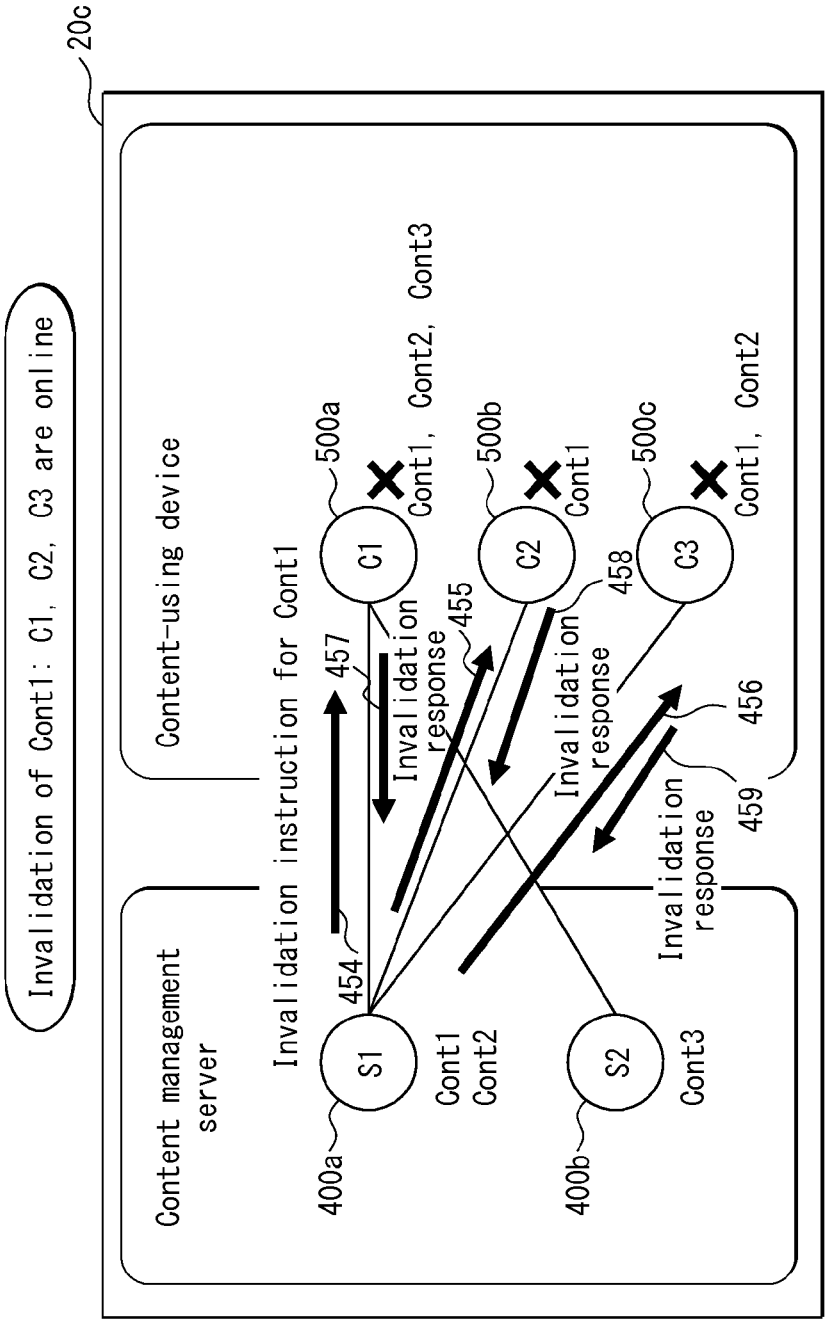

Invalidation of Cont1: C1, C2, C3 are online
20c
Content management server
Content-using device
Invalidation instruction for Cont1
457
454
455
458
456
459
Invalidation response
Invalidation response
Invalidation response
S1
S2
C1
C2
C3
400a
400b
500a
500b
500c
Cont1
Cont2
Cont3
Cont1, Cont2, Cont3
Cont1
Cont1, Cont2

FIG. 38

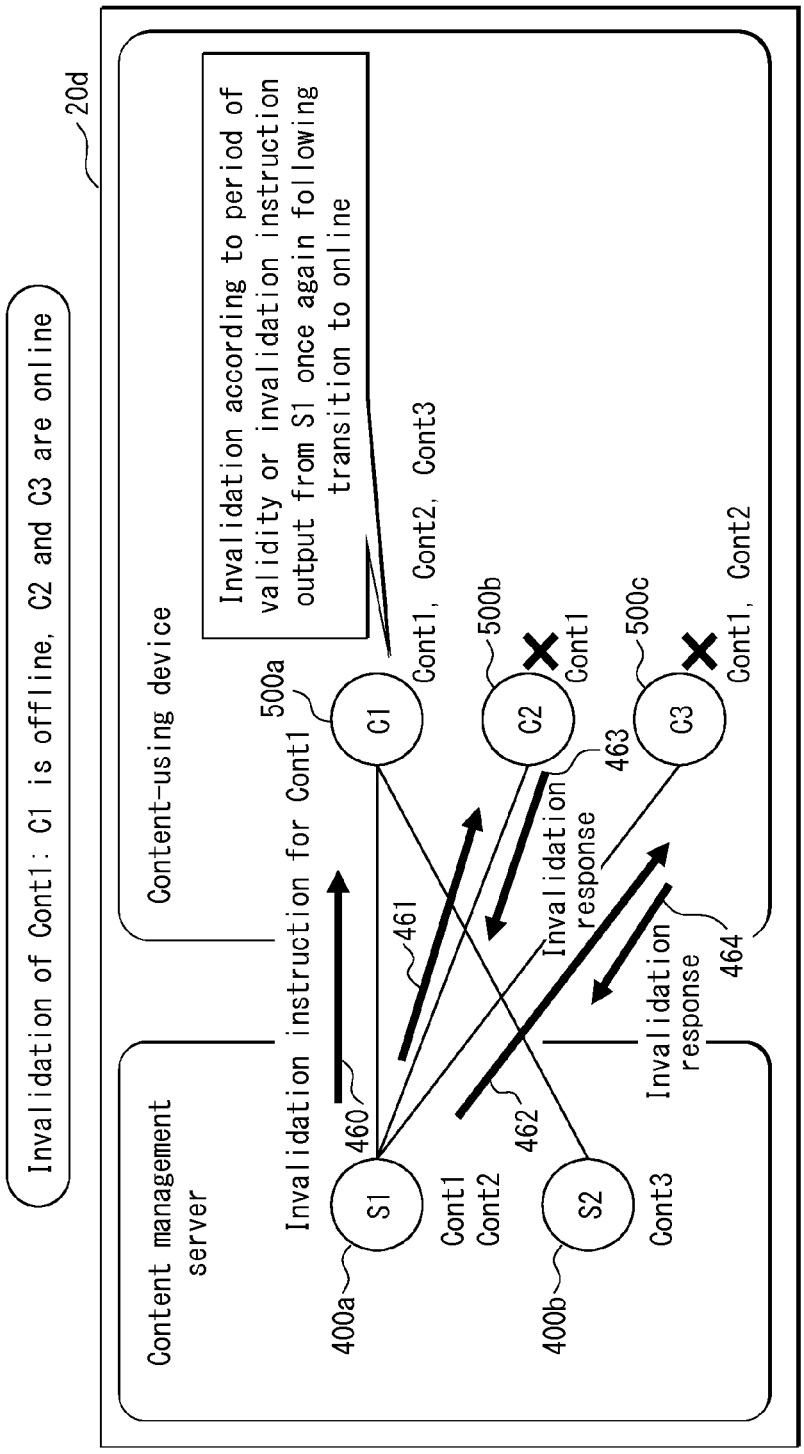

Invalidation of Cont1: C1 is offline, C2 and C3 are online
20d
Content-using device
Content management server
Invalidation instruction for Cont1
Invalidation according to period of validity or invalidation instruction output from S1 once again following transition to online
500a
C1
Cont1, Cont2, Cont3
500b
C2
Cont1
500c
C3
Cont1, Cont2
463
Invalidation response
464
Invalidation response
461
460
462
S1
Cont1
Cont2
400a
S2
Cont3
400b

FIG. 39

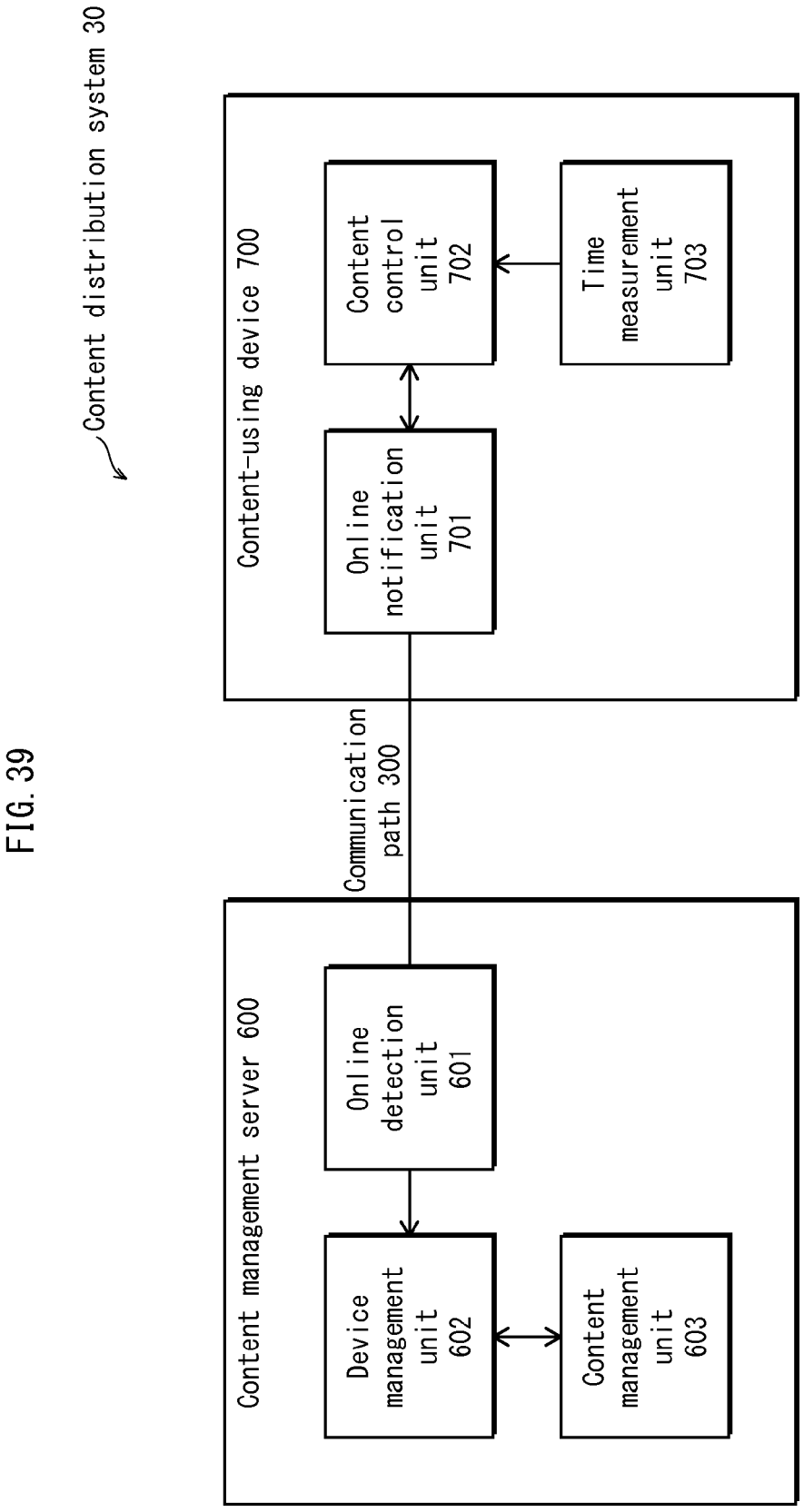

Content distribution system 30
Content-using device 700
Content control unit 702
Time measurement unit 703
Online notification unit 701
Communication path 300
Content management server 600
Online detection unit 601
Device management unit 602
Content management unit 603

FIG. 40

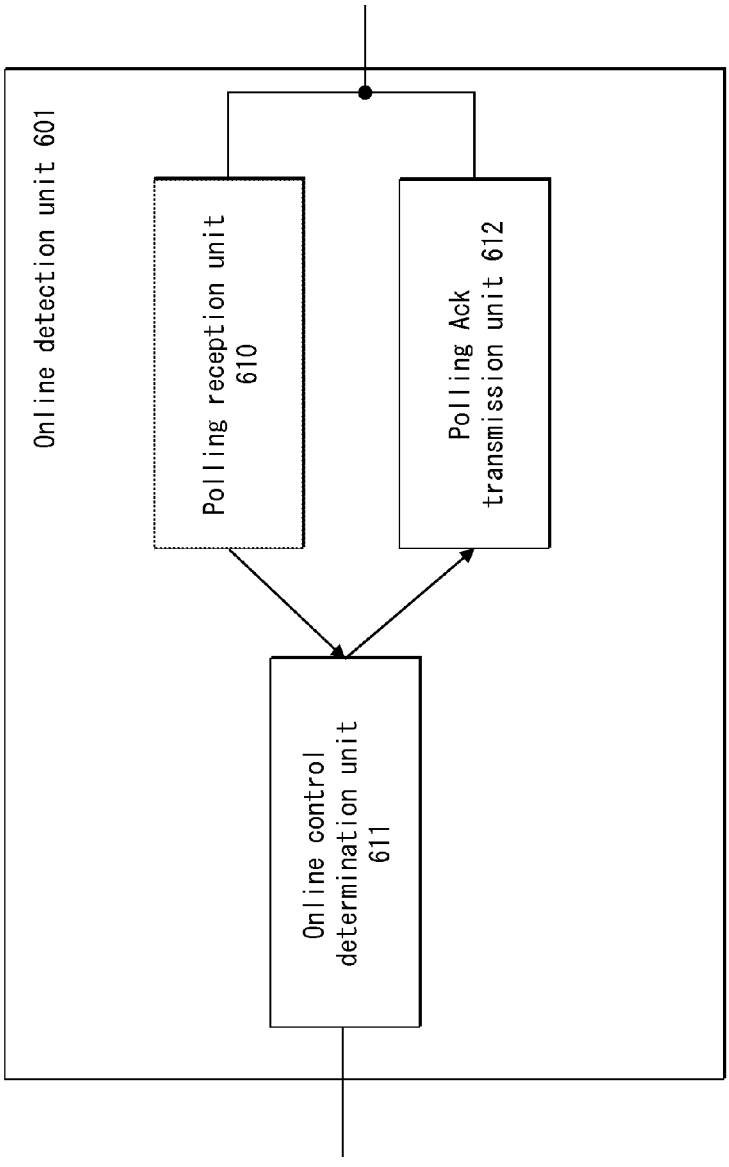

Online detection unit 601
Polling reception unit 610
Polling Ack transmission unit 612
Online control determination unit 611

FIG. 41

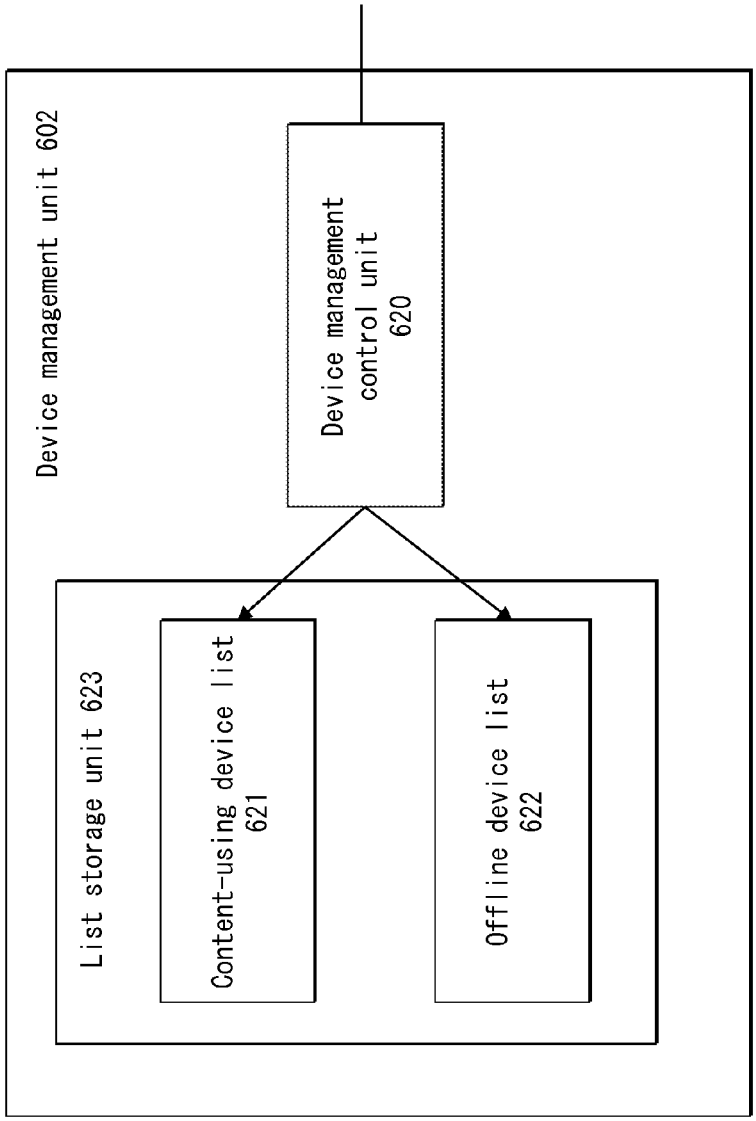

Device management unit 602
Device management control unit 620
List storage unit 623
Content-using device list 621
Offline device list 622

FIG. 42

Content-using device list 621

Content-using device information	
Content-using device name	IP address
C1	210.160.1.21
C2	210.160.1.22
C3	210.160.1.23

FIG. 43

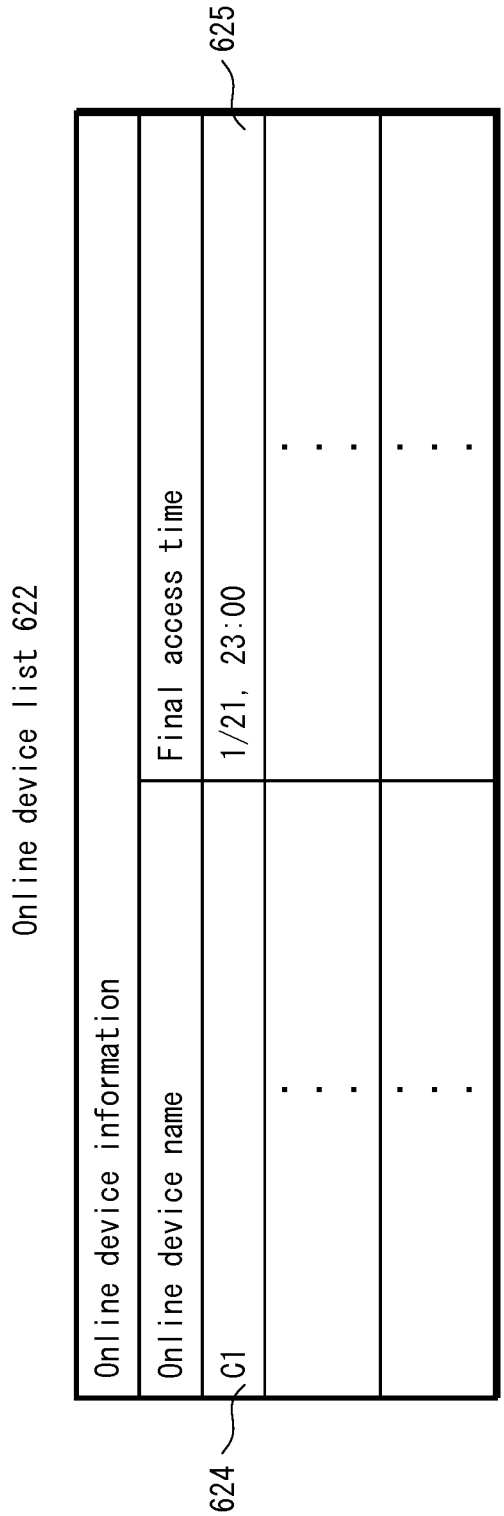

Online device list 622
Online device information
Online device name
Final access time
C1
1/21, 23:00
624
625

FIG. 44

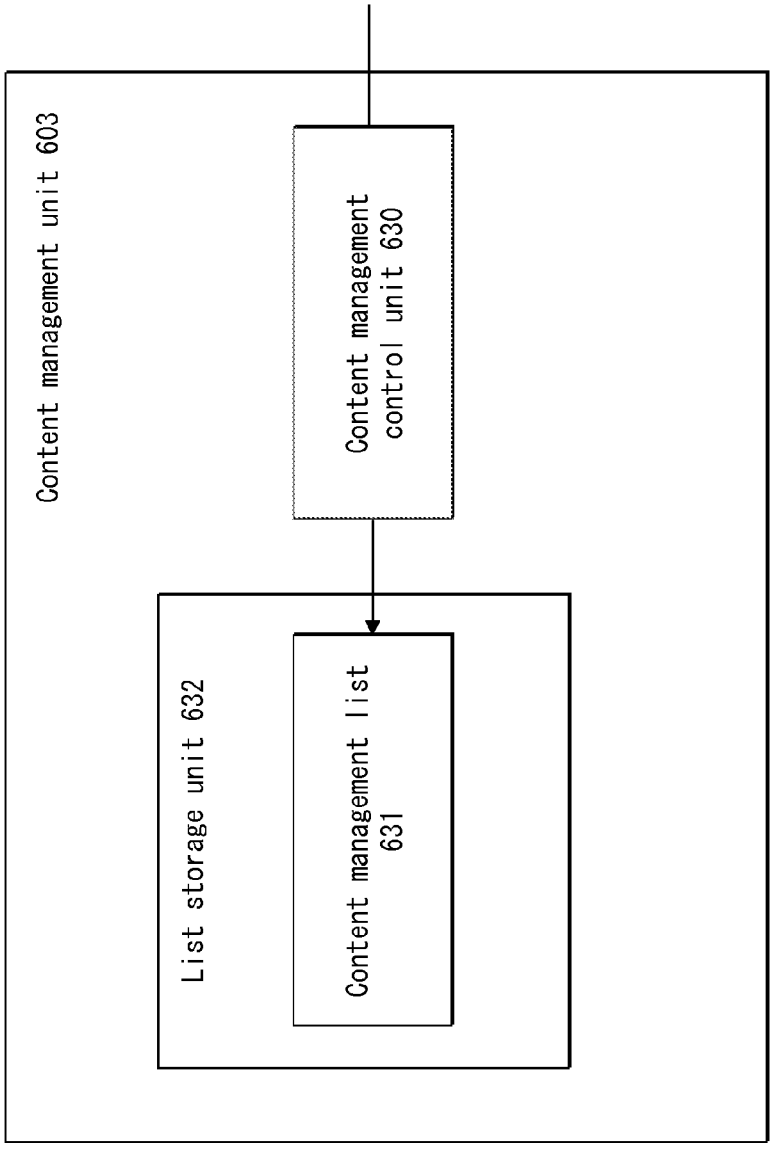

Content management unit 603
Content management control unit 630
List storage unit 632
Content management list 631

FIG. 45

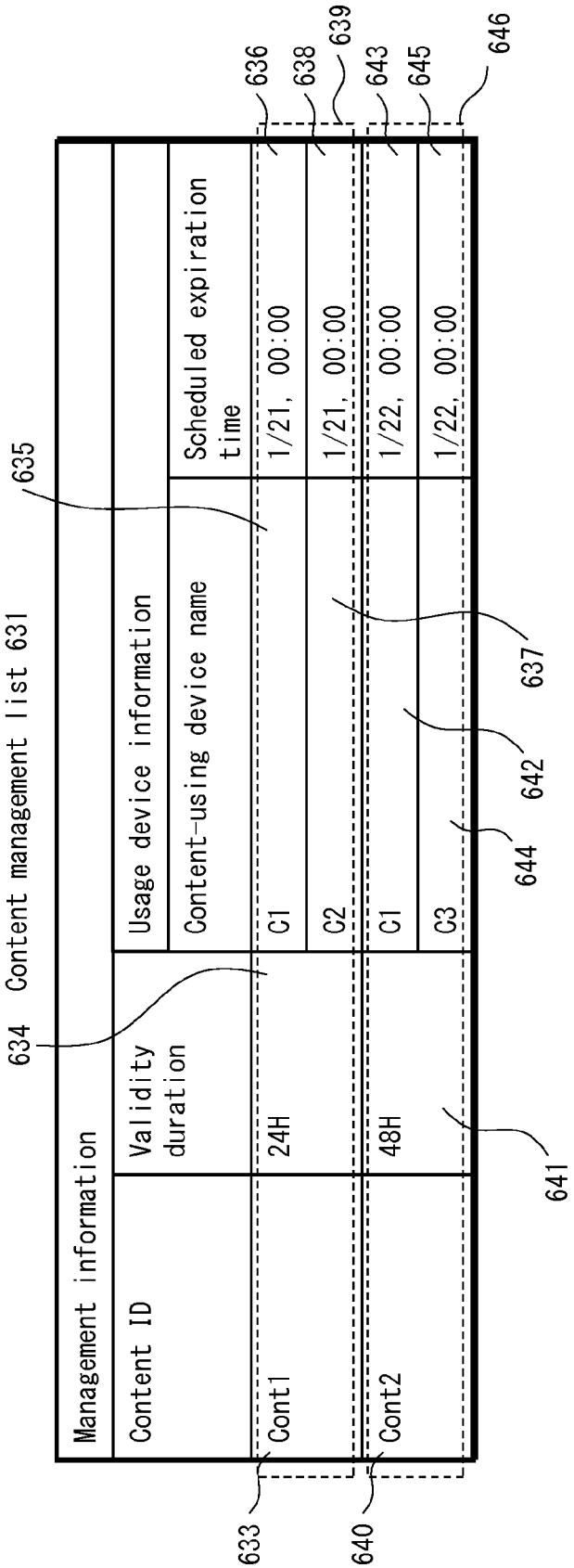

Content management list 631
634
635
636
638
639
643
645
646
637
642
644
641
633
640
Management information
Content ID
Validity duration
Usage device information
Content-using device name
Scheduled expiration time
Cont1
24H
C1
1/21, 00:00
C2
1/21, 00:00
Cont2
48H
C1
1/22, 00:00
C3
1/22, 00:00

FIG. 46

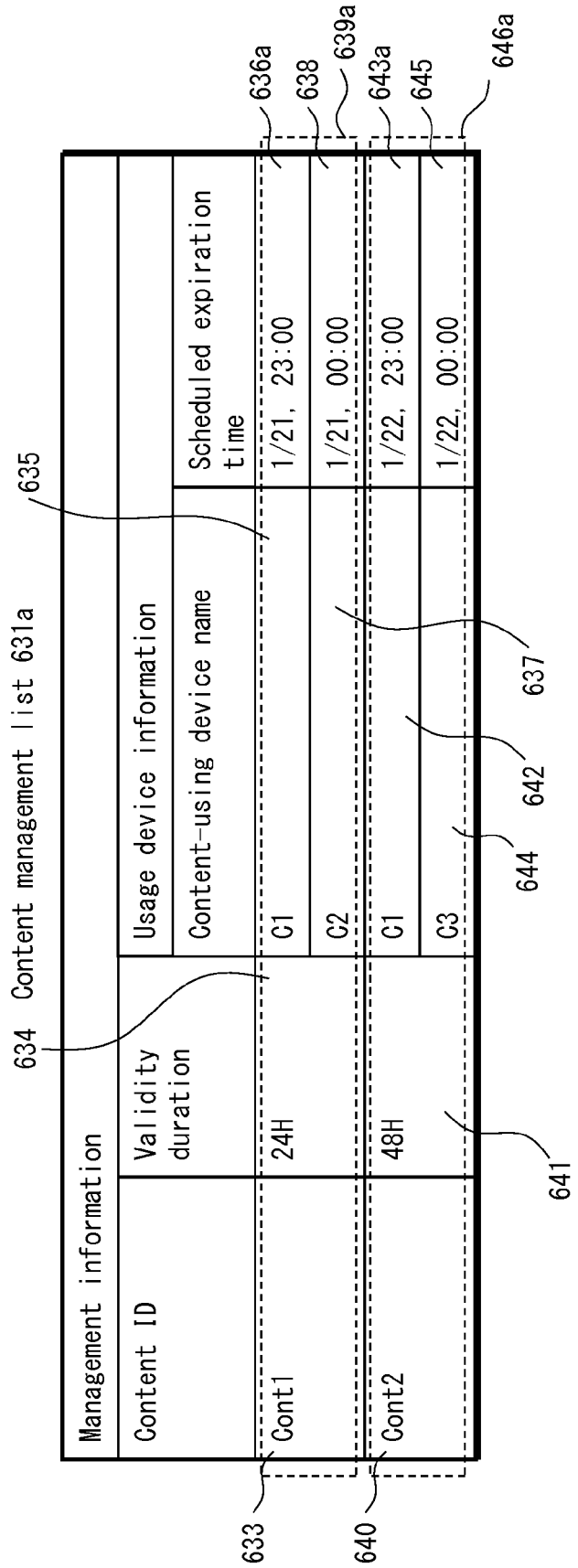

Content management list 631a
Management information
Content ID
Validity duration
Usage device information
Content-using device name
Scheduled expiration time
Cont1
24H
C1
1/21, 23:00
C2
1/21, 00:00
Cont2
48H
C1
1/22, 23:00
C3
1/22, 00:00
633
640
634
635
636a
638
639a
641
642
643a
644
645
646a
637

FIG. 47

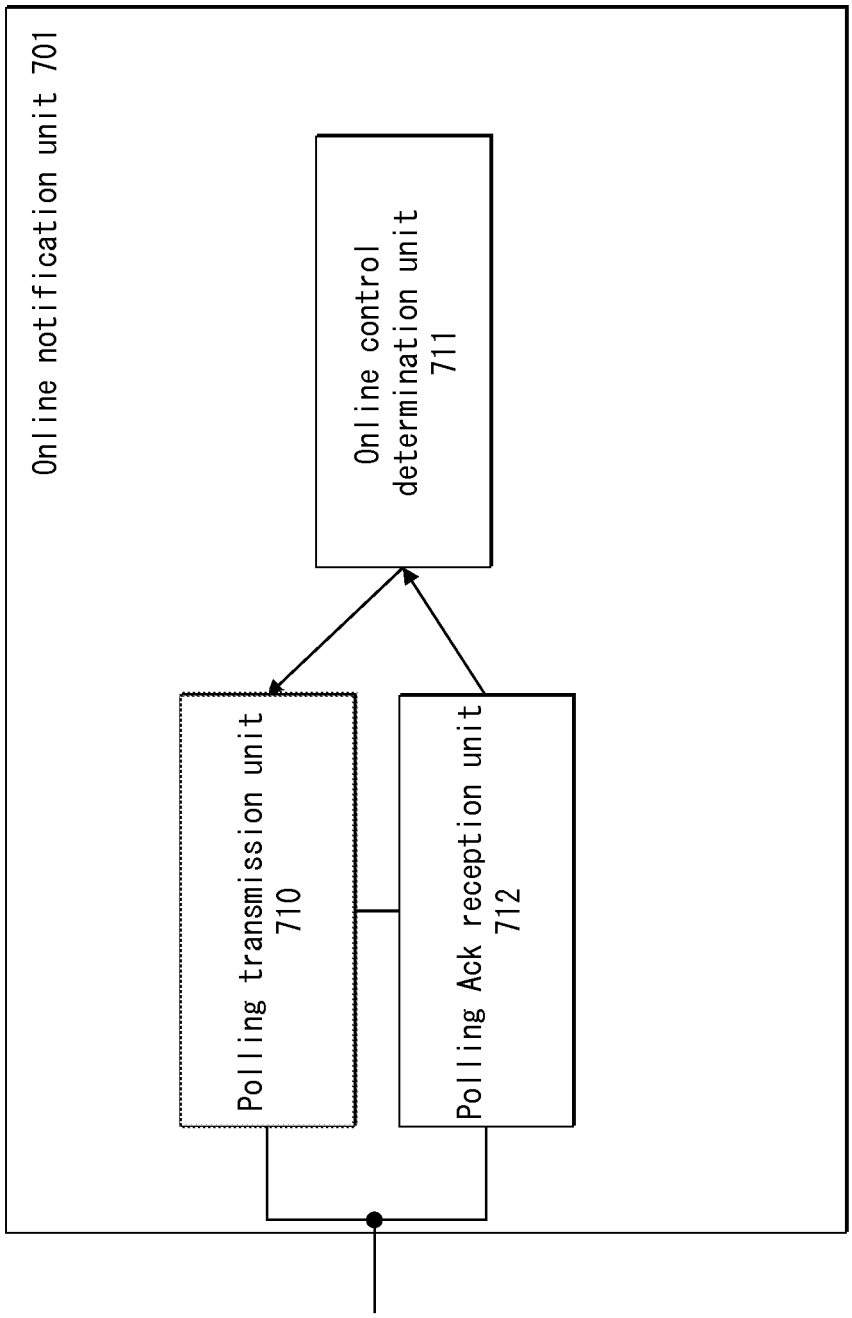

Online notification unit 701
Online control determination unit 711
Polling transmission unit 710
Polling Ack reception unit 712

FIG. 48

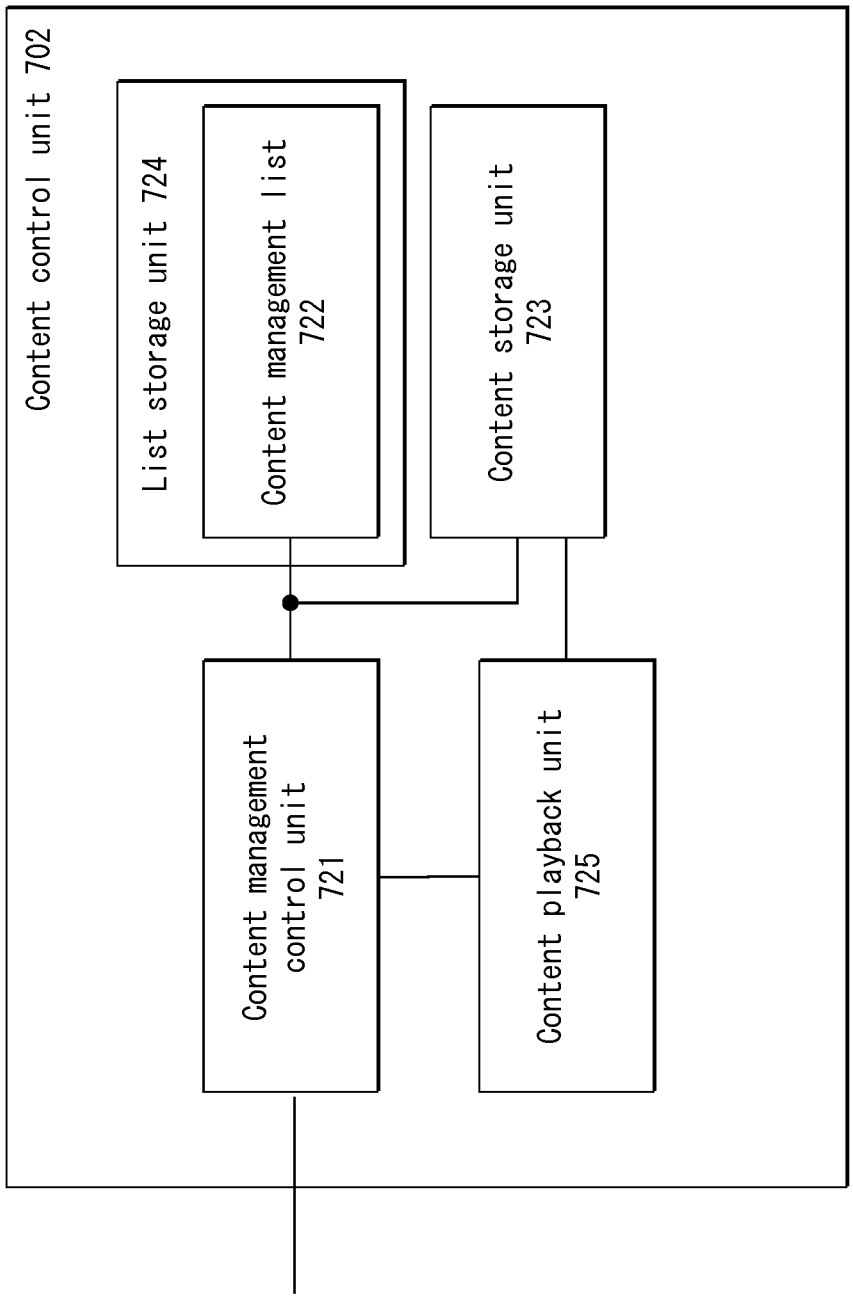

Content control unit 702
List storage unit 724
Content management list 722
Content storage unit 723
Content management control unit 721
Content playback unit 725

FIG. 49

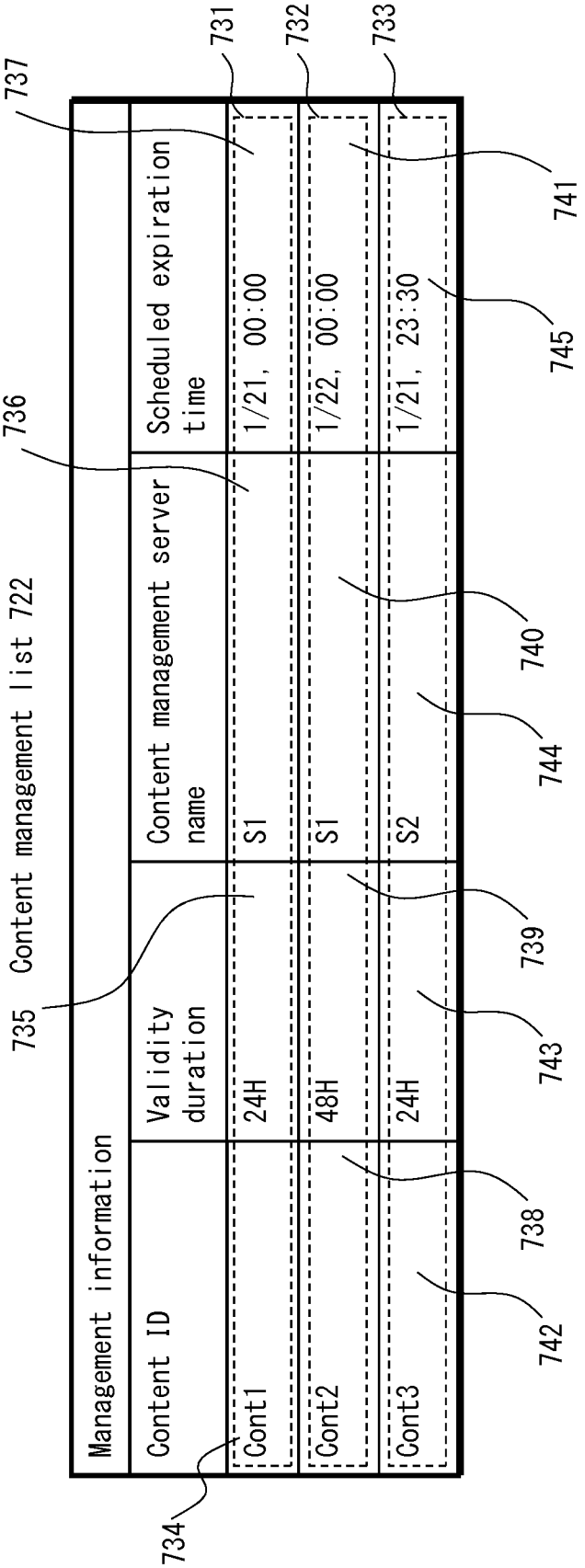

737
731
732
733
Content management list 722
Management information
Content ID
Validity duration
Content management server name
Scheduled expiration time
Cont1
24H
S1
1/21, 00:00
Cont2
48H
S1
1/22, 00:00
Cont3
24H
S2
1/21, 23:30
735
736
734
738
739
740
741
742
743
744
745

FIG. 50

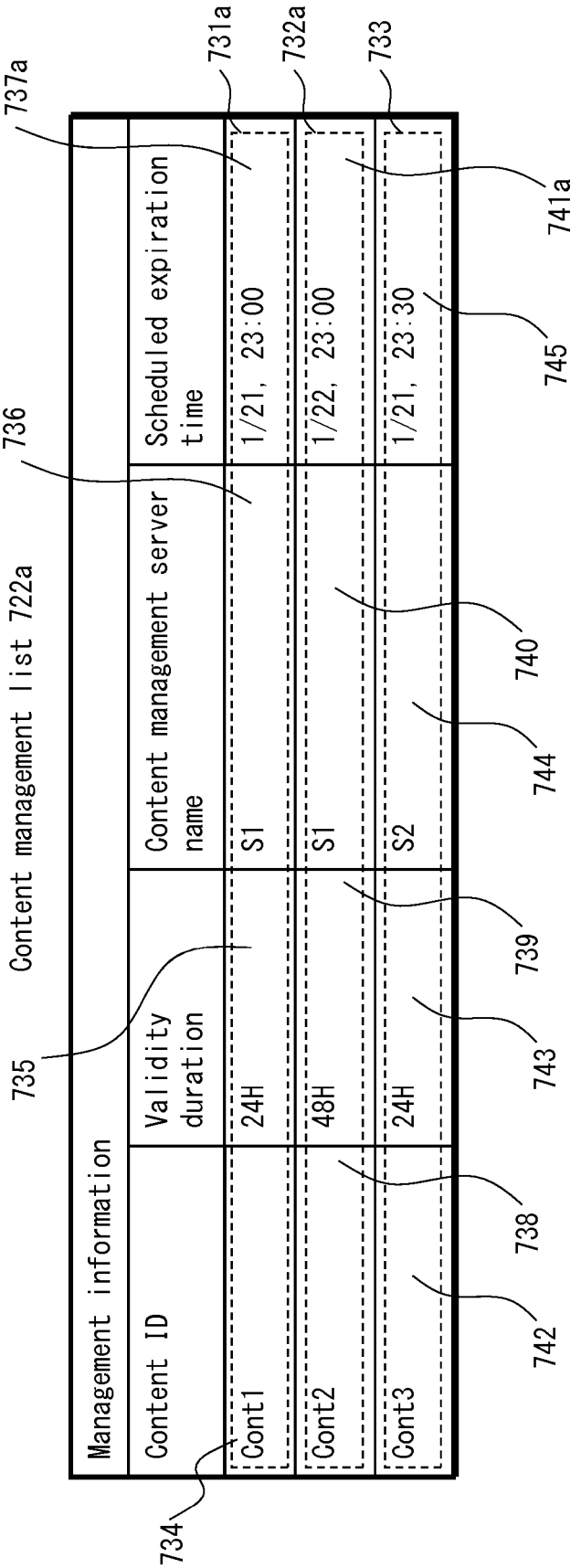

Content management list 722a
Management information
Content ID
Validity duration
Content management server name
Scheduled expiration time
Cont1
24H
S1
1/21, 23:00
Cont2
48H
S1
1/22, 23:00
Cont3
24H
S2
1/21, 23:30
731a
732a
733
734
735
736
737a
738
739
740
741a
742
743
744
745

FIG. 51

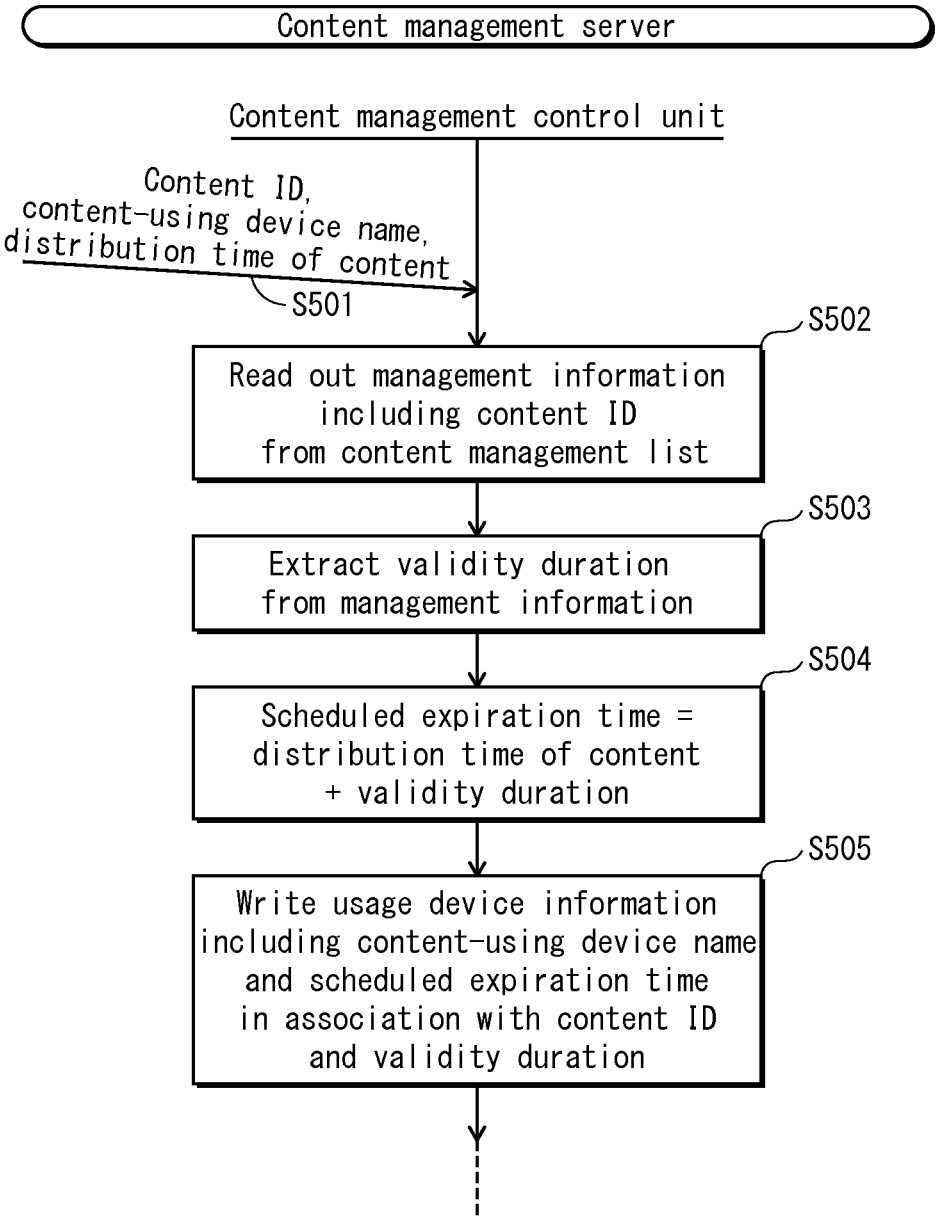
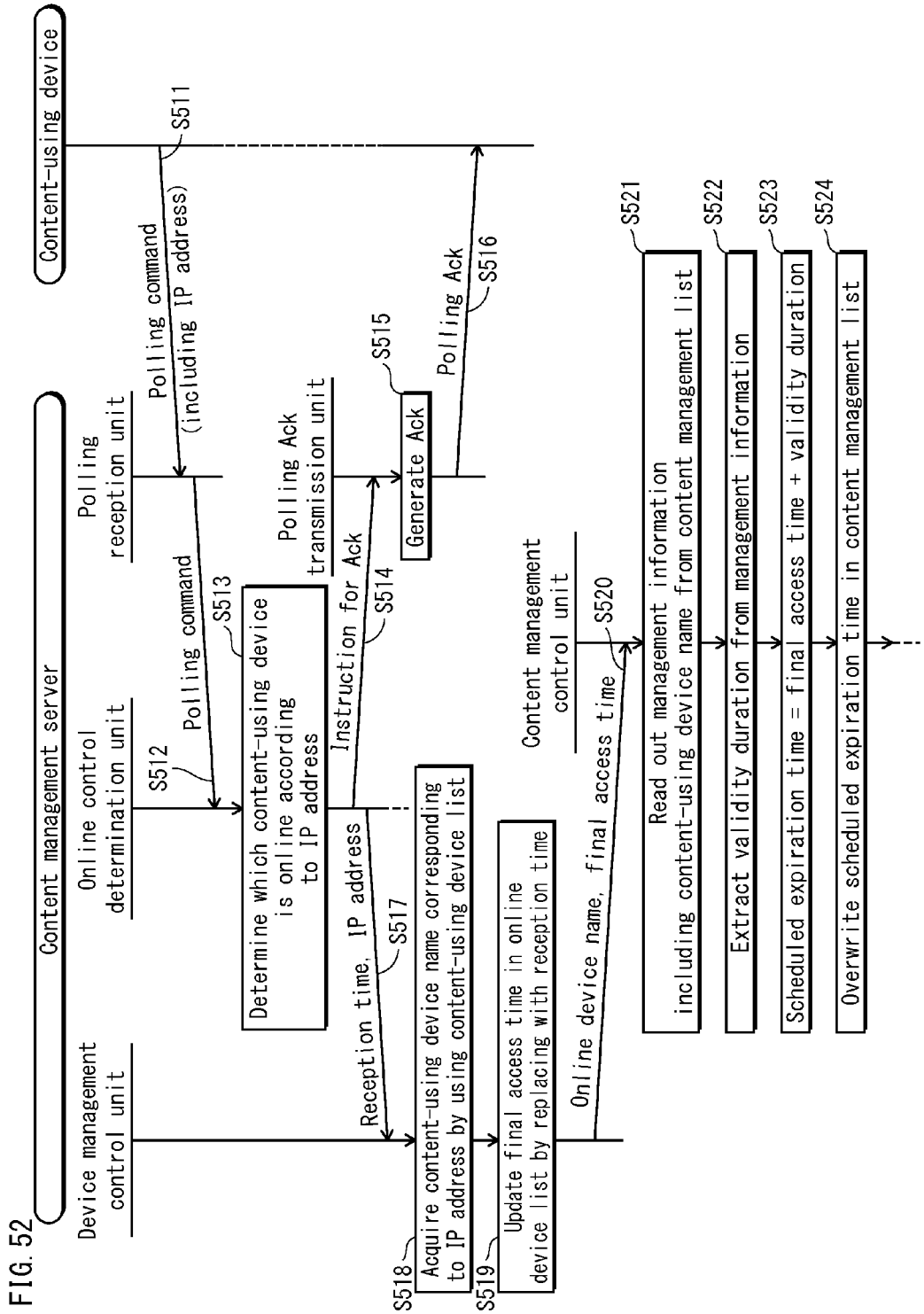

Content management server
Content management control unit
Content ID,
content-using device name,
distribution time of content
S501
S502
Read out management information including content ID from content management list
S503
Extract validity duration from management information
S504
Scheduled expiration time = distribution time of content + validity duration
S505
Write usage device information including content-using device name and scheduled expiration time in association with content ID and validity duration

FIG. 52


Content management server
Device management control unit
Online control determination unit
Polling reception unit
Content-using device
Content management control unit
Polling command (including IP address)
S511
Polling command
S512
Determine which content-using device is online according to IP address
S513
Polling Ack transmission unit
Instruction for Ack
S514
Generate Ack
S515
Polling Ack
S516
Reception time, IP address
S517
Acquire content-using device name corresponding to IP address by using content-using device list
S518
Update final access time in online device list by replacing with reception time
S519
Online device name, final access time
S520
Read out management information including content-using device name from content management list
S521
Extract validity duration from management information
S522
Scheduled expiration time = final access time + validity duration
S523
Overwrite scheduled expiration time in content management list
S524

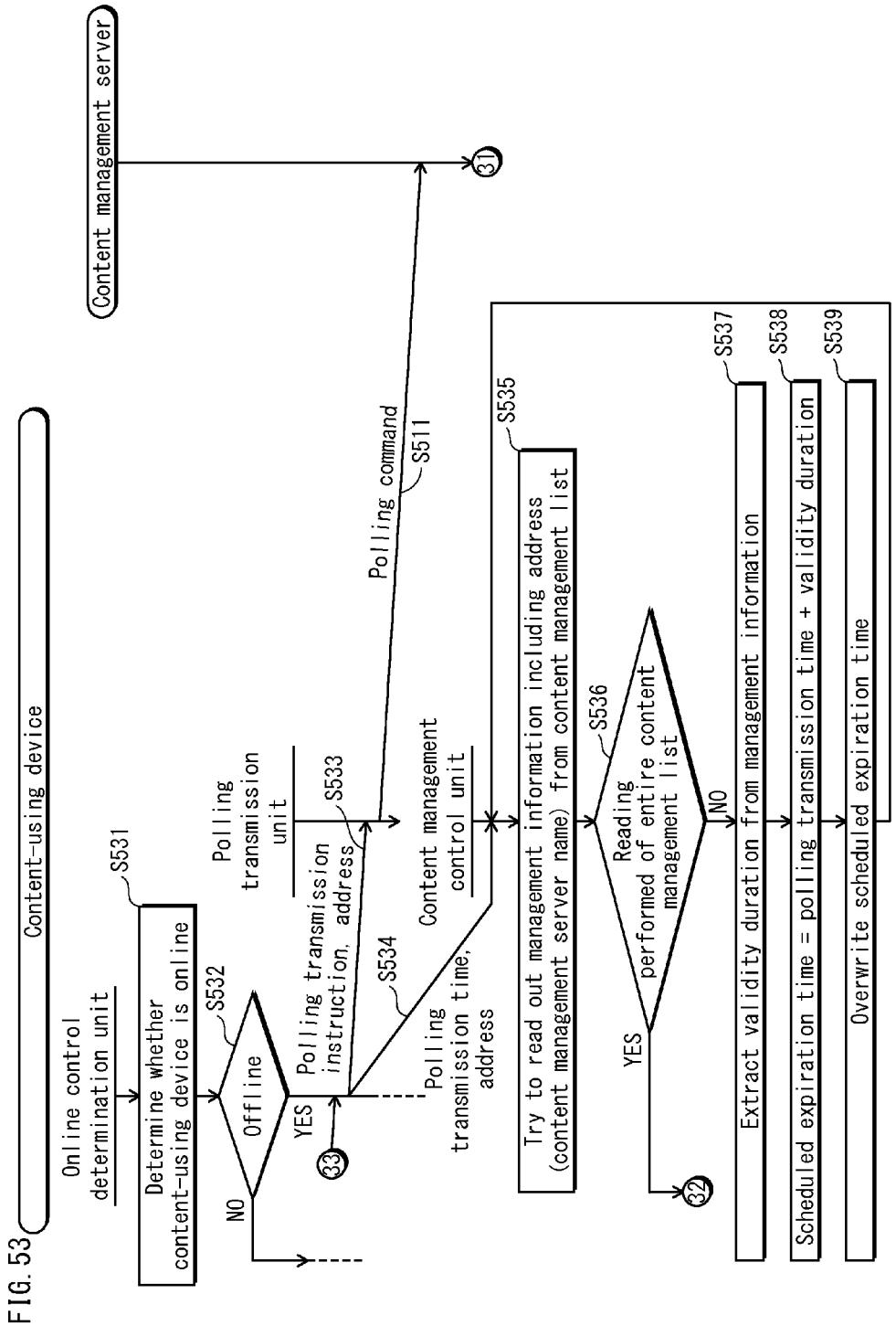

Content-using device
Online control determination unit
S531
Determine whether content-using device is online
S532
Offline
NO
YES
33
Polling transmission unit
Polling transmission instruction, address
S533
S534
Polling transmission time, address
Content management control unit
Polling command
S511
31
Content management server
S535
Try to read out management information including address (content management server name) from content management list
S536
Reading performed of entire content management list
YES
NO
32
S537
Extract validity duration from management information
S538
Scheduled expiration time = polling transmission time + validity duration
S539
Overwrite scheduled expiration time

FIG. 53

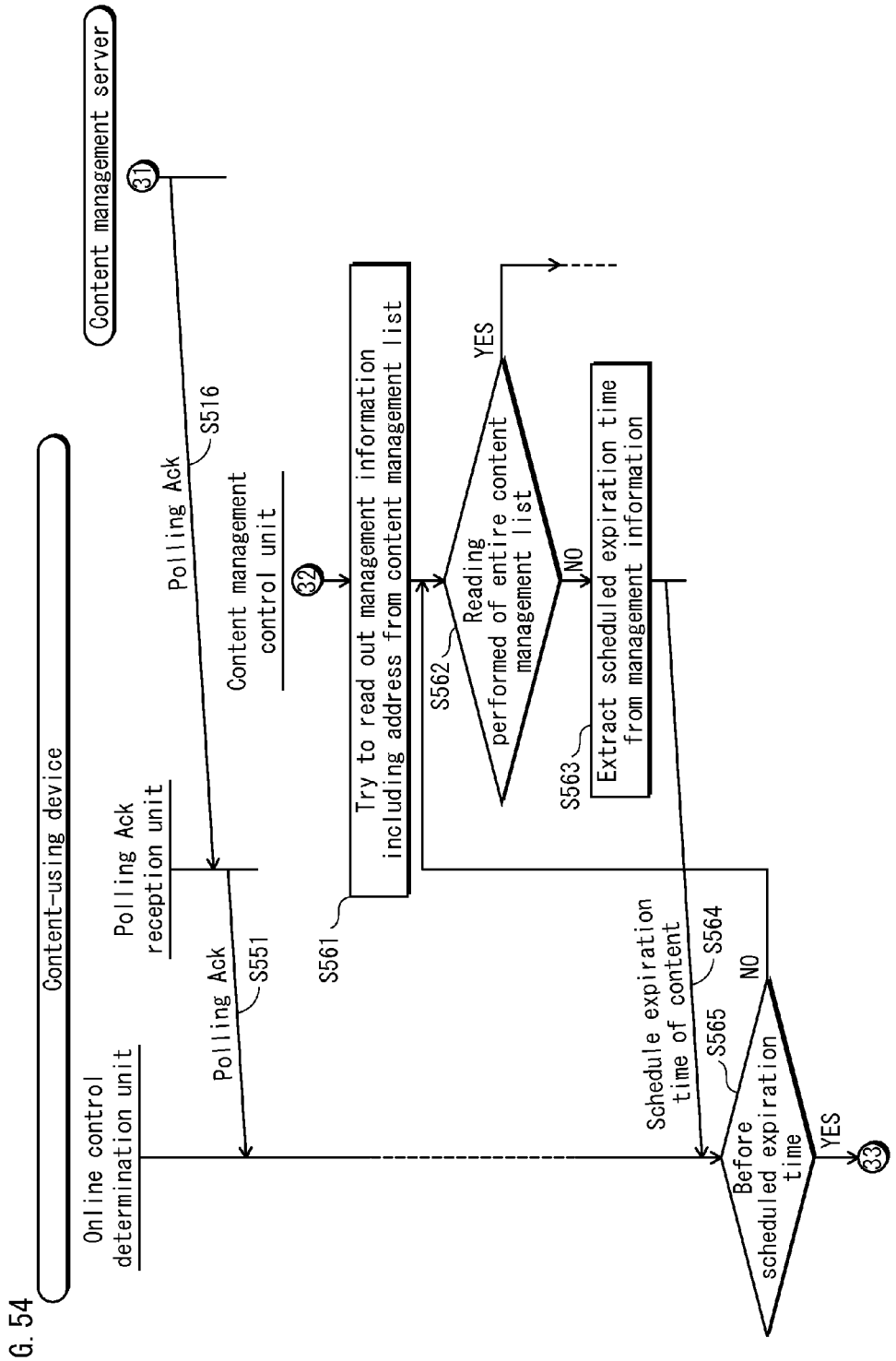

Content-using device
Online control determination unit
Polling Ack reception unit
Content management server
Content management control unit
Polling Ack
S551
Polling Ack
S516
31
32
S561
Try to read out management information including address from content management list
S562
Reading performed of entire content management list
YES
NO
S563
Extract scheduled expiration time from management information
Schedule expiration time of content
S564
S565
Before scheduled expiration time
NO
YES
33

FIG. 54

FIG. 55

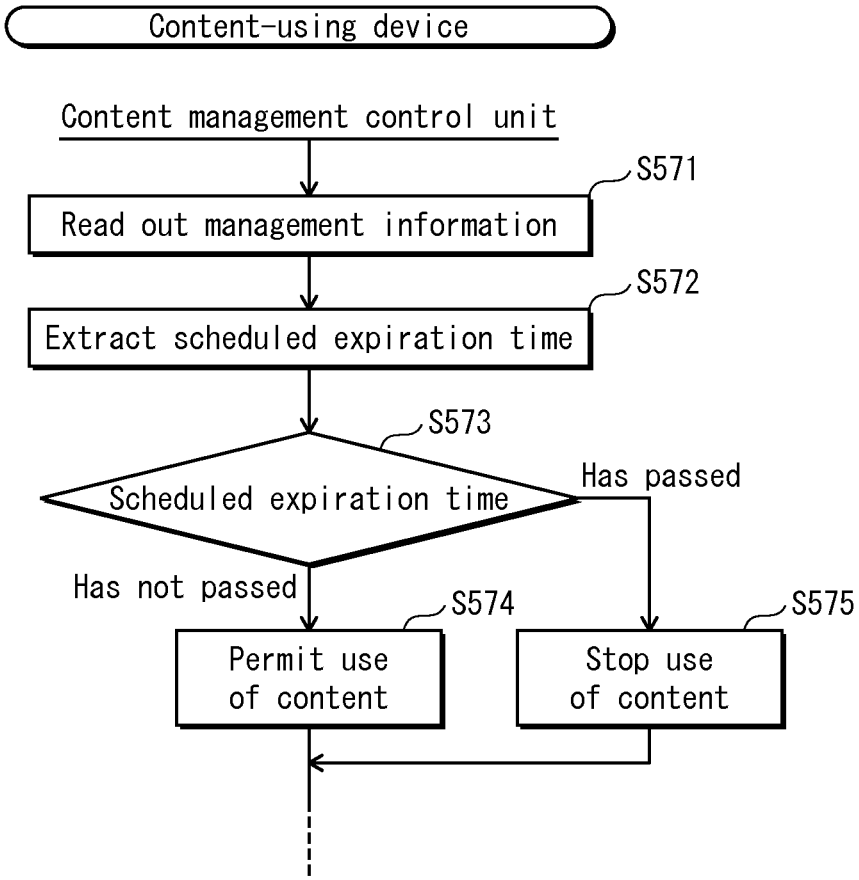

Content-using device
Content management control unit
S571
Read out management information
S572
Extract scheduled expiration time
S573
Scheduled expiration time
Has passed
Has not passed
S574
Permit use of content
S575
Stop use of content

FIG. 56

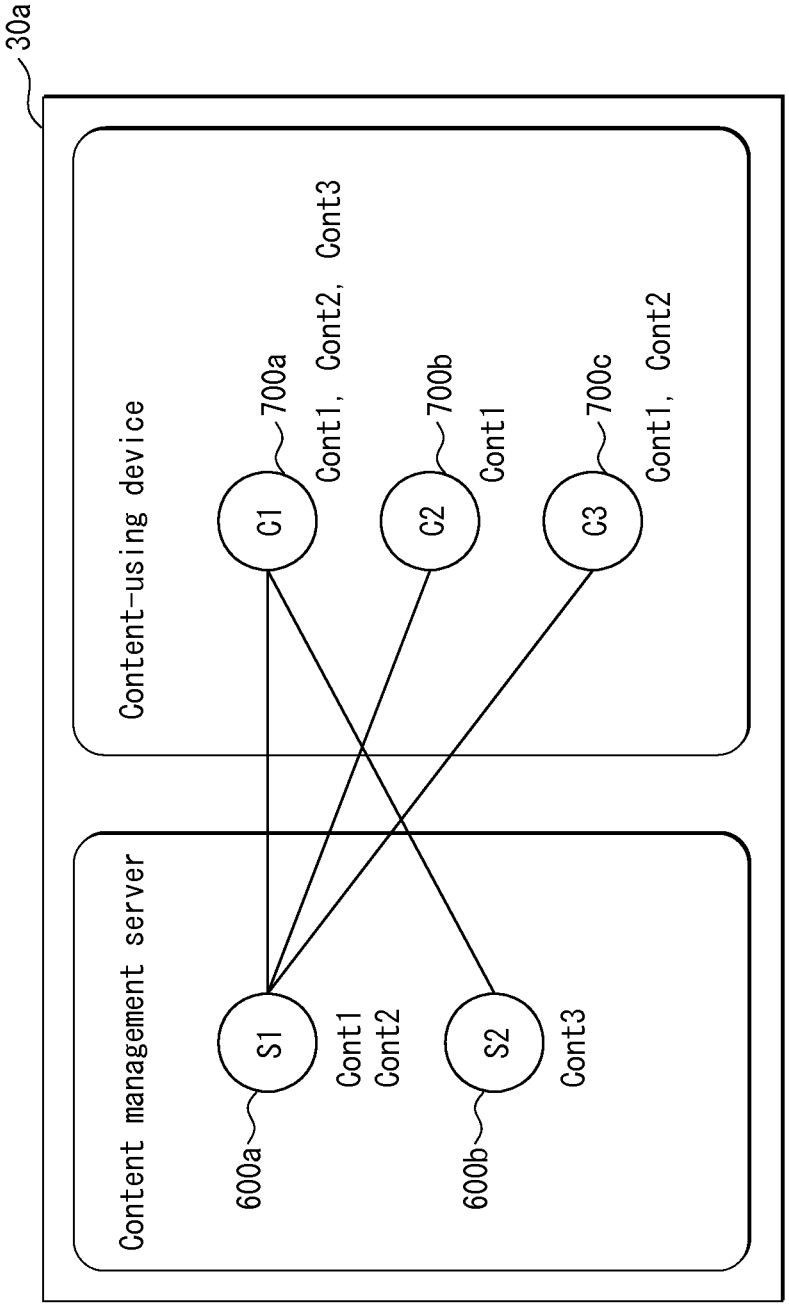

30a
Content-using device
C1
700a
Cont1, Cont2, Cont3
C2
700b
Cont1
C3
700c
Cont1, Cont2
Content management server
S1
Cont1
Cont2
600a
S2
Cont3
600b

FIG. 57

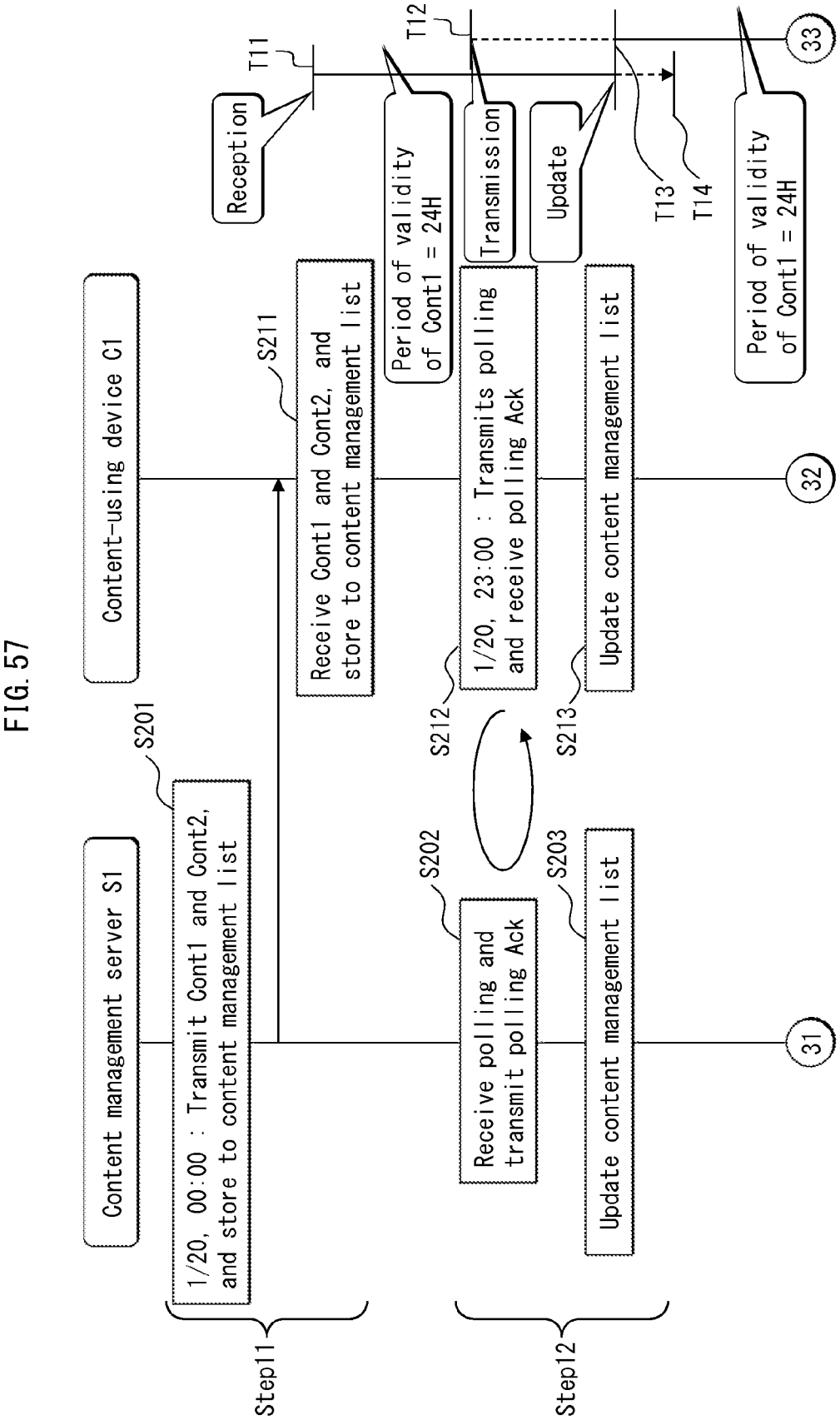

Content management server S1
Content-using device C1
S201
1/20, 00:00 : Transmit Cont1 and Cont2, and store to content management list
S211
Receive Cont1 and Cont2, and store to content management list
Reception
T11
Period of validity of Cont1 = 24H
T12
S202
Receive polling and transmit polling Ack
S212
1/20, 23:00 : Transmits polling and receive polling Ack
Transmission
S203
Update content management list
S213
Update content management list
Update
T13
T14
Period of validity of Cont1 = 24H
31
32
33
Step11
Step12

FIG. 58

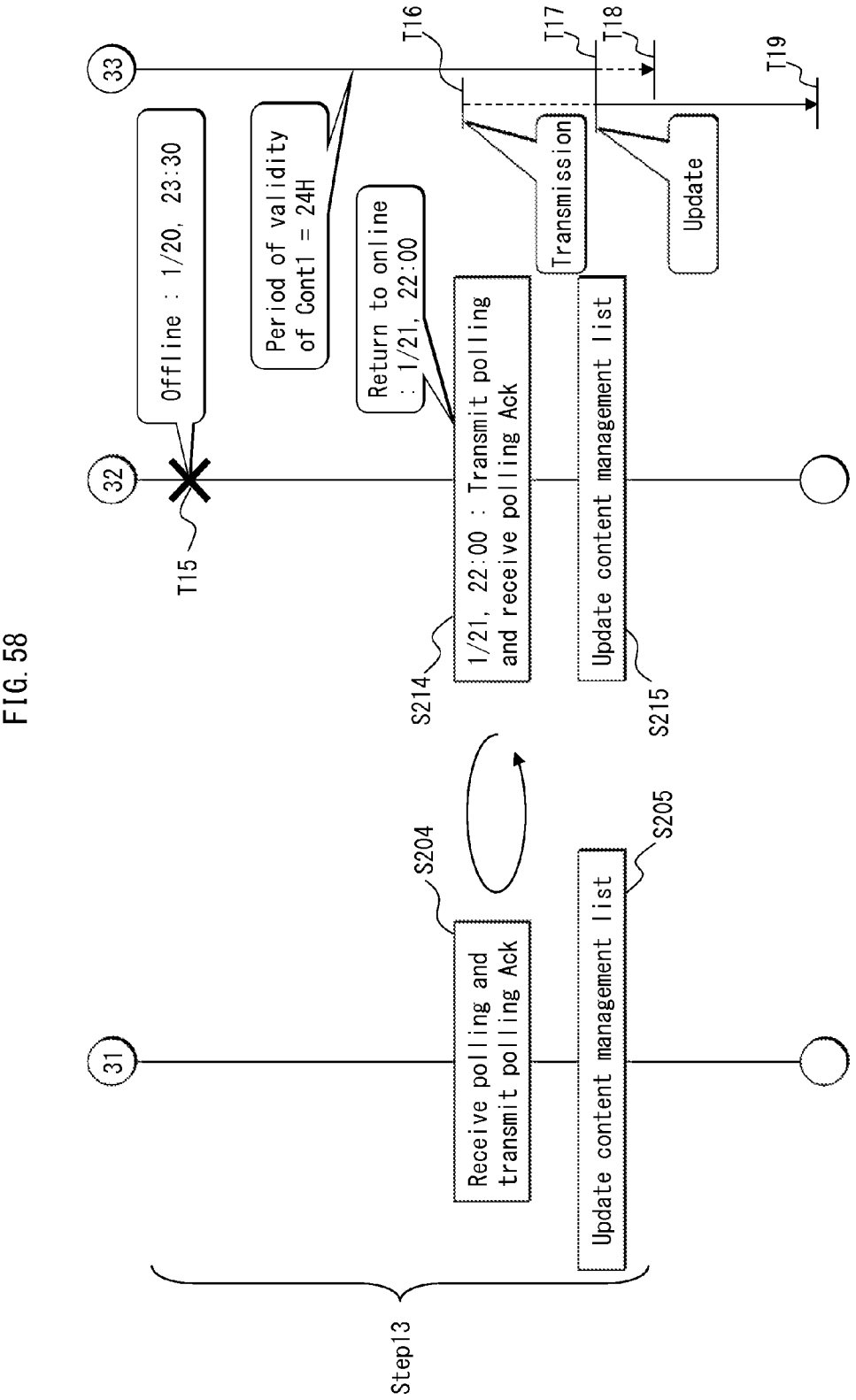

Step13
31
32
33
Receive polling and transmit polling Ack
S204
Update content management list
S205
1/21, 22:00 : Transmit polling and receive polling Ack
S214
Update content management list
S215
Offline : 1/20, 23:30
T15
Period of validity of Cont1 = 24H
Return to online : 1/21, 22:00
T16
Transmission
T17
T18
Update
T19

FIG. 59

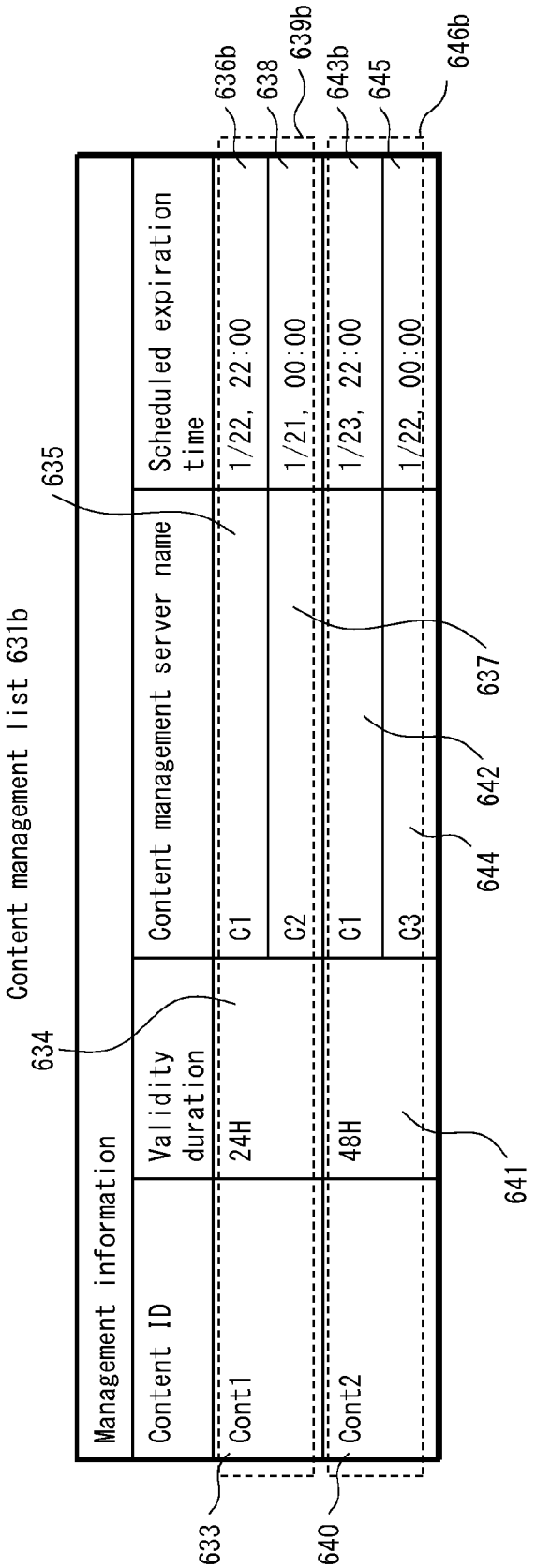

Content management list 631b
Management information
Content ID
Validity duration
Content management server name
Scheduled expiration time
Cont1
24H
C1
1/22, 22:00
C2
1/21, 00:00
Cont2
48H
C1
1/23, 22:00
C3
1/22, 00:00
633
634
635
636b
637
638
639b
640
641
642
643b
644
645
646b

FIG. 60

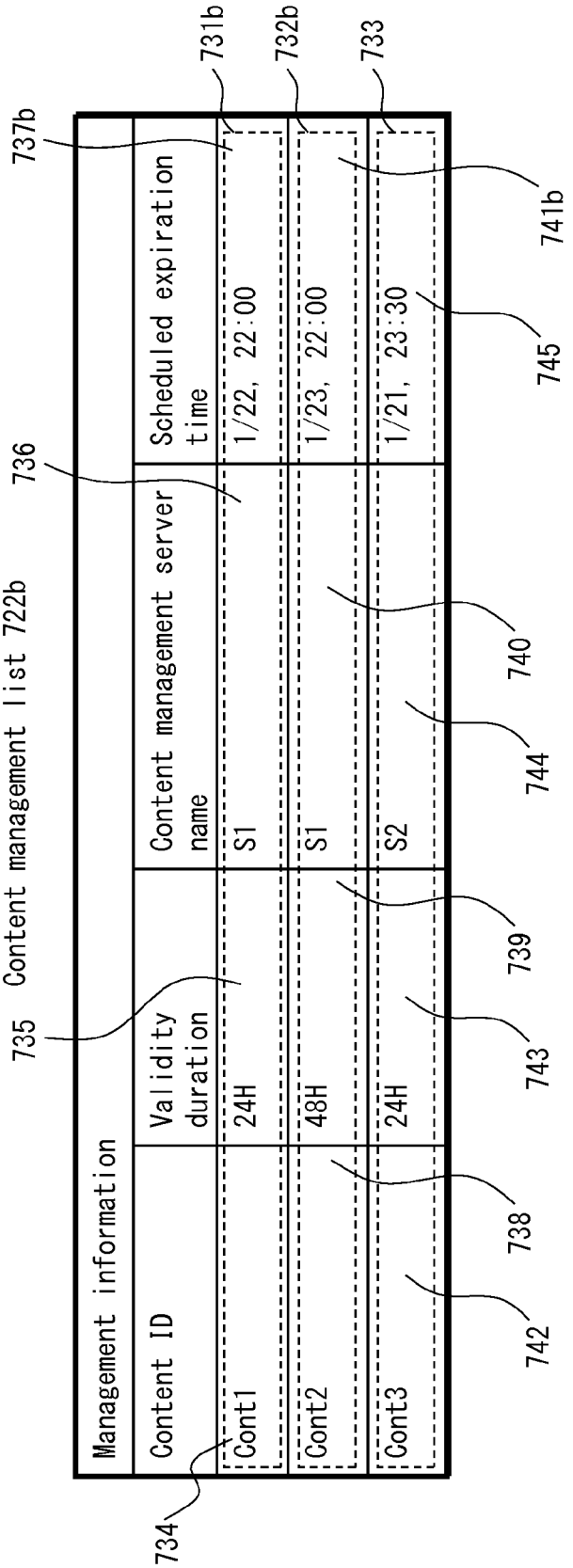

Content management list 722b
Management information
Content ID
Validity duration
Content management server name
Scheduled expiration time
Cont1
24H
S1
1/22, 22:00
Cont2
48H
S1
1/23, 22:00
Cont3
24H
S2
1/21, 23:30
731b
732b
733
737b
736
735
734
738
739
740
741b
742
743
744
745

FIG. 61

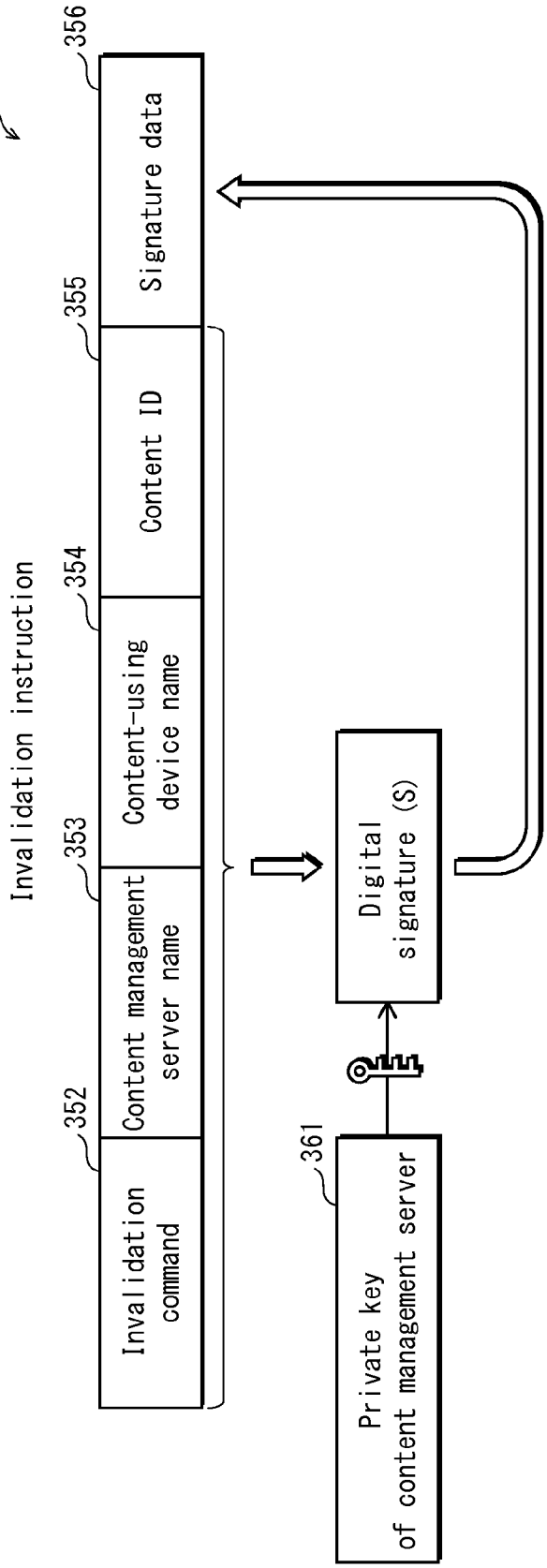

351
Invalidation instruction
352
Invalidation command
353
Content management server name
354
Content-using device name
355
Content ID
356
Signature data
Digital signature (S)
361
Private key of content management server

FIG. 62

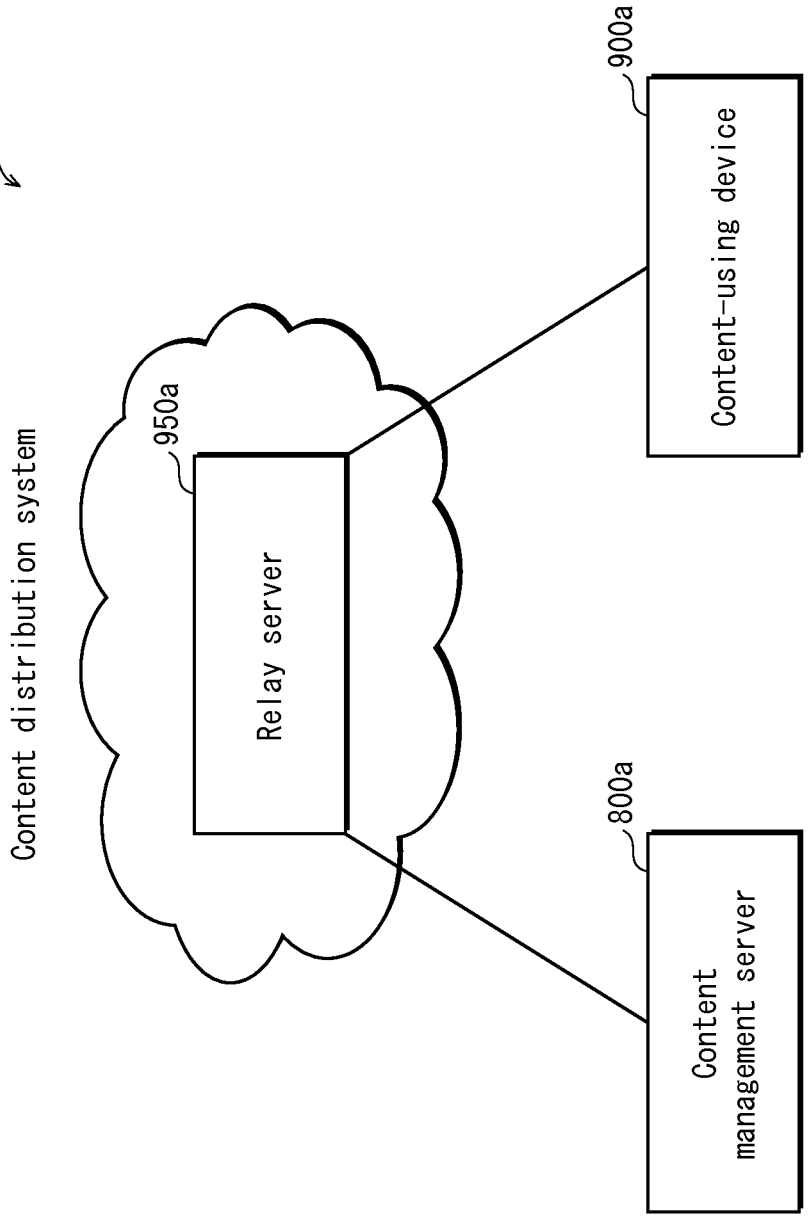

50
Content distribution system
950a
Relay server
900a
Content-using device
800a
Content management server

FIG. 63

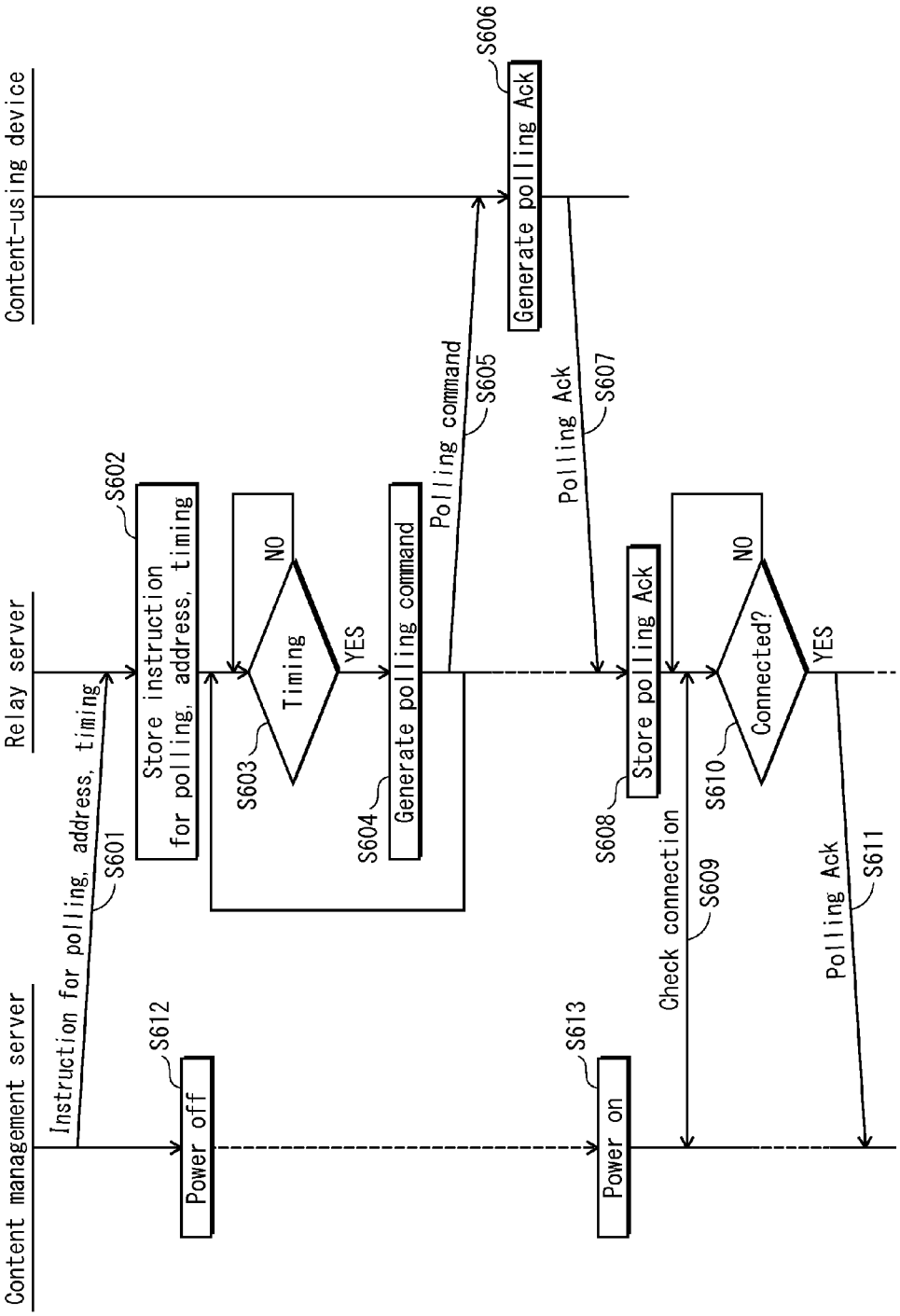

Content-using device
Relay server
Content management server
Instruction for polling, address, timing
S601
Store instruction for polling, address, timing
S602
Timing
S603
NO
YES
Generate polling command
S604
Polling command
S605
Generate polling Ack
S606
Polling Ack
S607
Store polling Ack
S608
Check connection
S609
Connected?
S610
NO
YES
Polling Ack
S611
Power off
S612
Power on
S613

FIG. 64

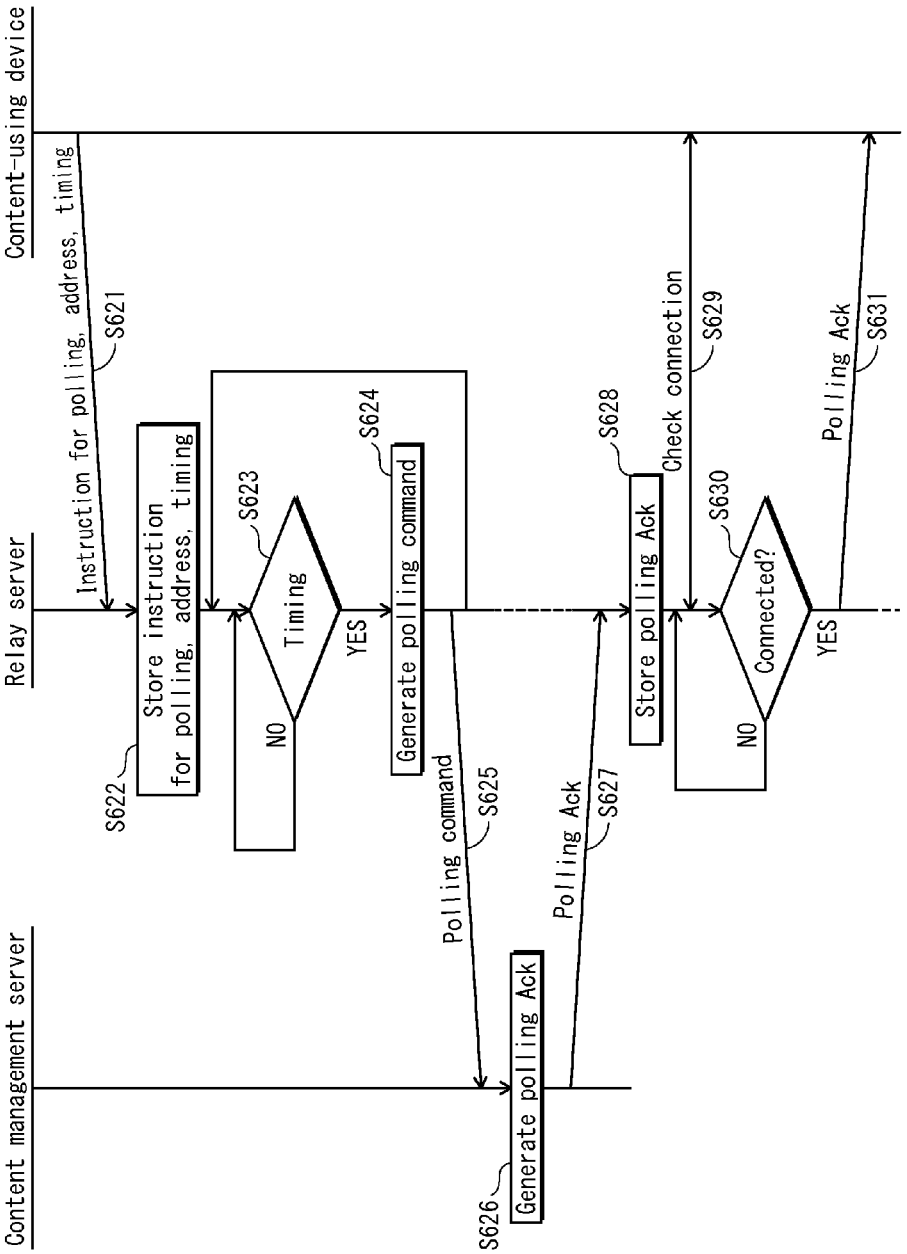

Content-using device
Relay server
Content management server
Instruction for polling, address, timing
S621
Store instruction for polling, address, timing
S622
Timing
S623
NO
YES
Generate polling command
S624
Polling command
S625
Generate polling Ack
S626
Polling Ack
S627
Store polling Ack
S628
Check connection
S629
Connected?
S630
NO
YES
Polling Ack
S631

FIG. 65

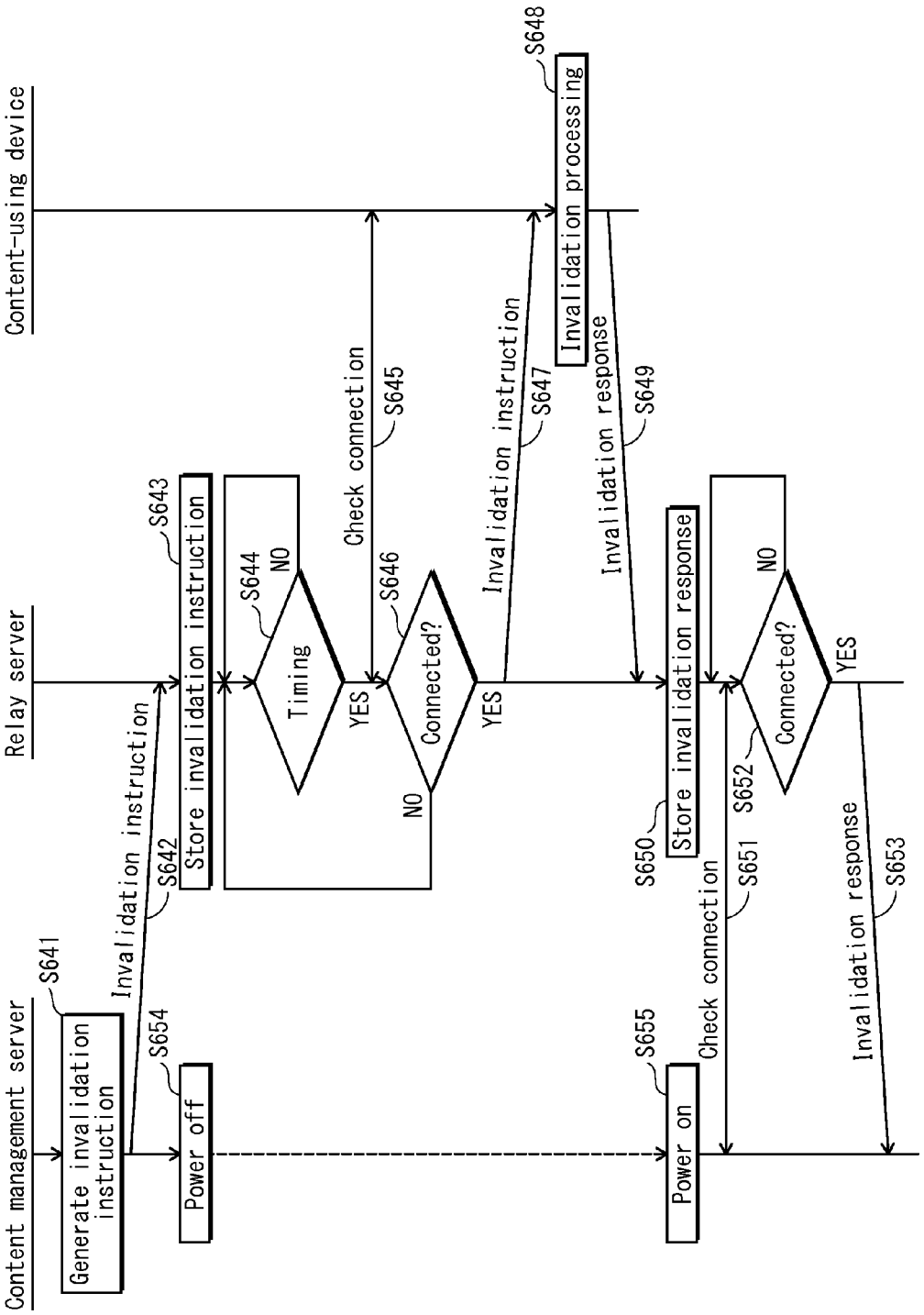

Content management server
Relay server
Content-using device
Generate invalidation instruction
S641
Invalidation instruction
S642
Store invalidation instruction
S643
Timing
S644
NO
YES
Check connection
S645
Connected?
S646
NO
YES
Invalidation instruction
S647
Invalidation processing
S648
Invalidation response
S649
Store invalidation response
S650
Power off
S654
Power on
S655
Check connection
S651
Connected?
S652
NO
YES
Invalidation response
S653

FIG. 66

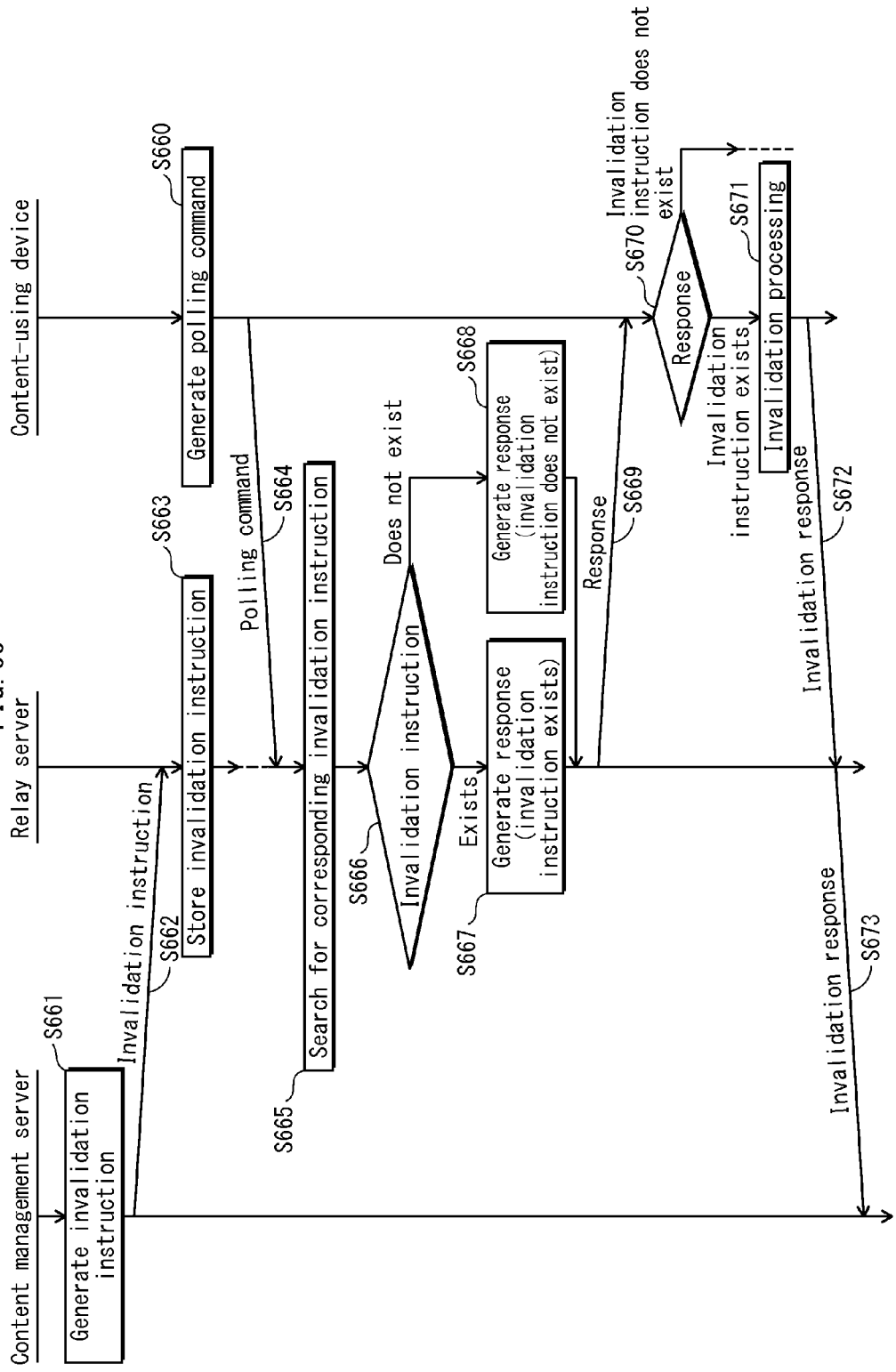

Content management server
Relay server
Content-using device
Generate invalidation instruction
S661
Invalidation instruction
S662
Store invalidation instruction
S663
Generate polling command
S660
Polling command
S664
Search for corresponding invalidation instruction
S665
Invalidation instruction
S666
Does not exist
Exists
S667
Generate response (invalidation instruction exists)
Generate response (invalidation instruction does not exist)
S668
Response
S669
Invalidation instruction does not exist
S670
Response
Invalidation instruction exists
S671
Invalidation processing
Invalidation response
S672
Invalidation response
S673

FIG. 67

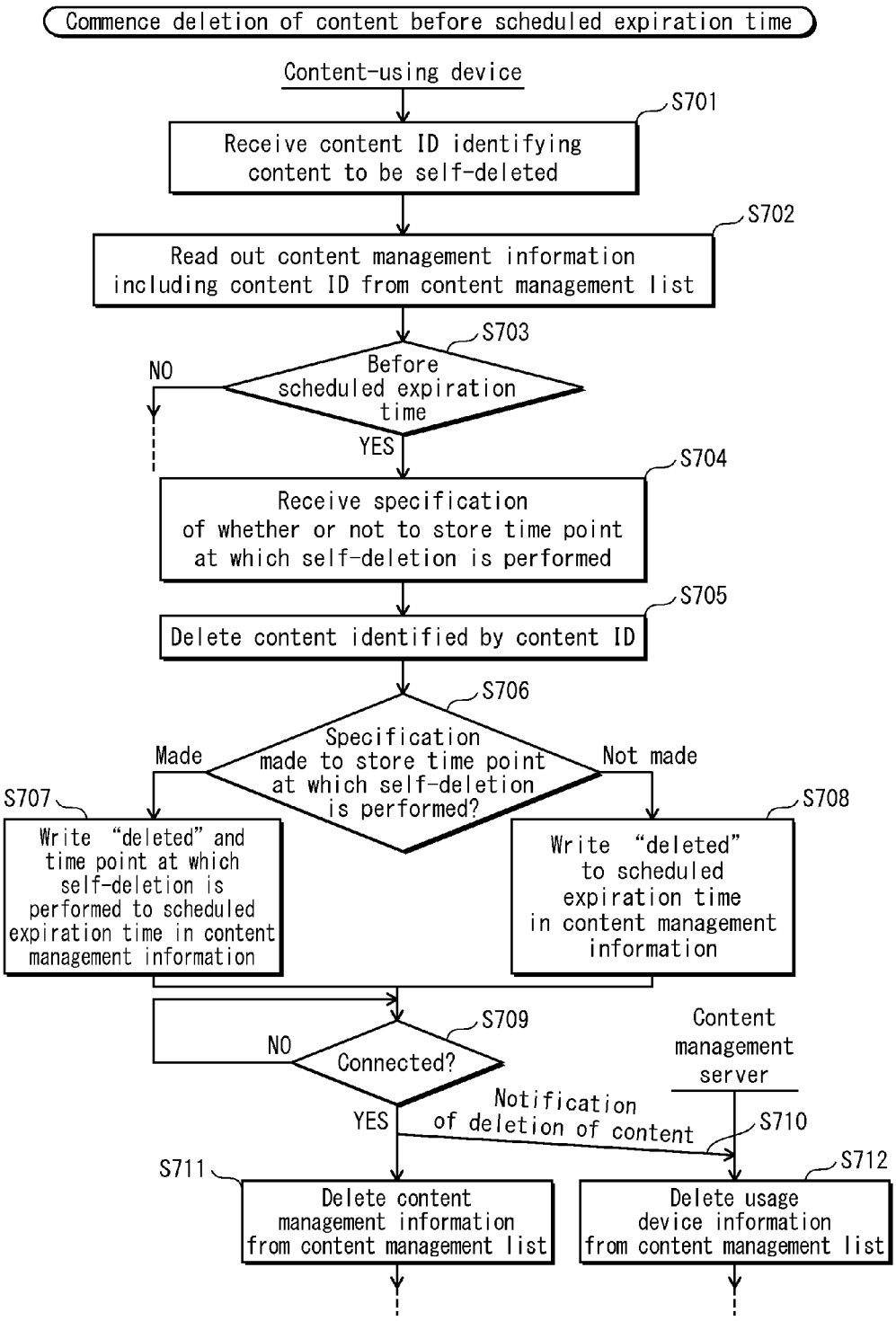

Commence deletion of content before scheduled expiration time
Content-using device
S701
Receive content ID identifying content to be self-deleted
S702
Read out content management information including content ID from content management list
S703
Before scheduled expiration time
NO
YES
S704
Receive specification of whether or not to store time point at which self-deletion is performed
S705
Delete content identified by content ID
S706
Specification made to store time point at which self-deletion is performed?
Made
Not made
S707
Write "deleted" and time point at which self-deletion is performed to scheduled expiration time in content management information
S708
Write "deleted" to scheduled expiration time in content management information
S709
Connected?
NO
YES
Content management server
Notification of deletion of content
S710
S711
Delete content management information from content management list
S712
Delete usage device information from content management list

FIG. 68

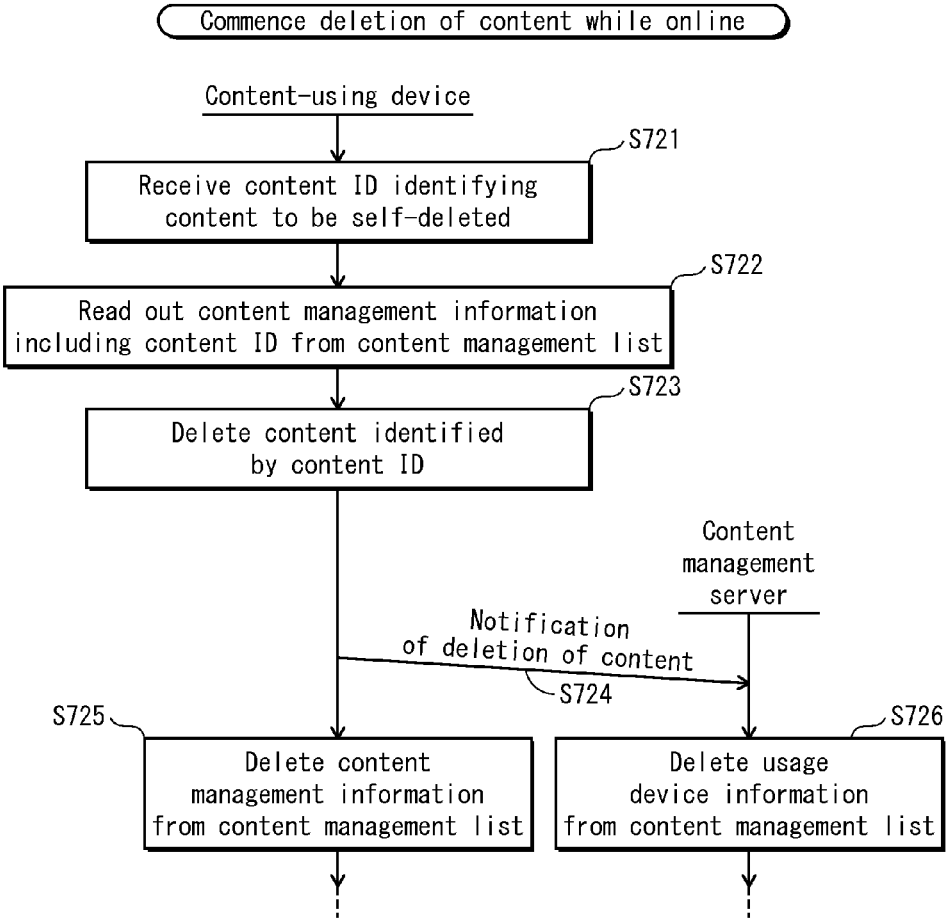
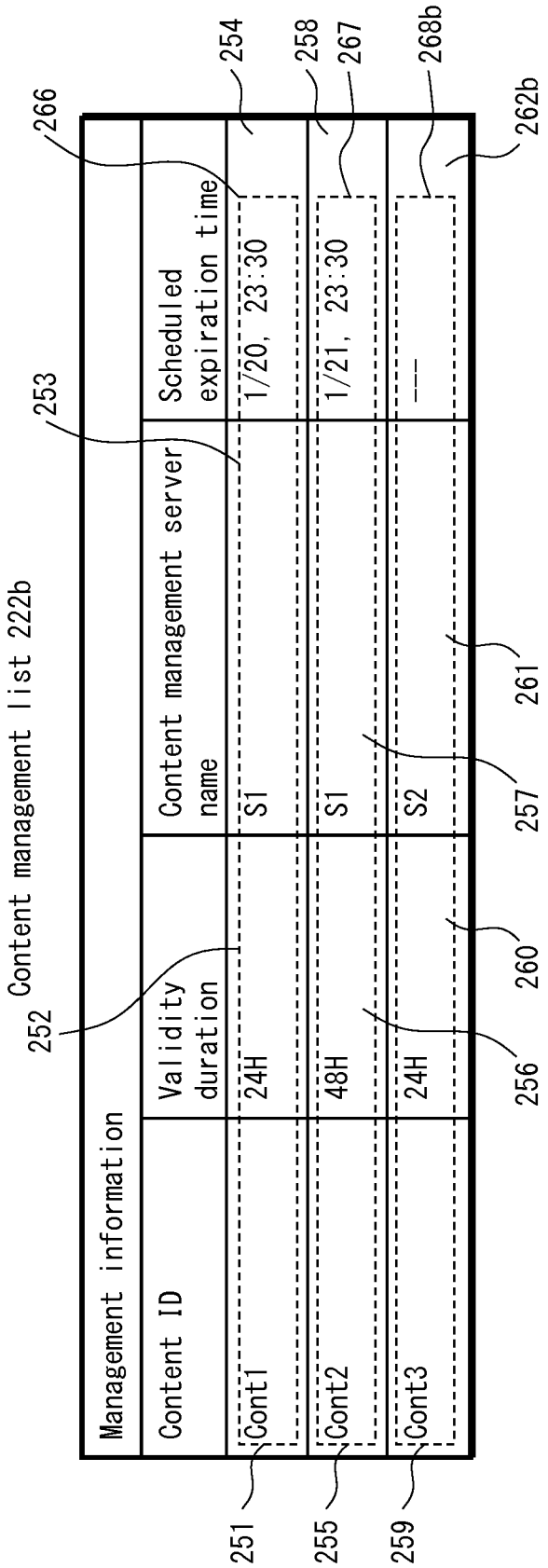

Commence deletion of content while online
Content-using device
S721
Receive content ID identifying content to be self-deleted
S722
Read out content management information including content ID from content management list
S723
Delete content identified by content ID
Content management server
Notification of deletion of content
S724
S725
Delete content management information from content management list
S726
Delete usage device information from content management list

FIG. 69


Content management list 222b
Management information
Content ID
Validity duration
Content management server name
Scheduled expiration time
Cont1
24H
S1
1/20, 23:30
Cont2
48H
S1
1/21, 23:30
Cont3
24H
S2

252
253
254
256
257
258
260
261
262b
266
267
268b
251
255
259

CONTENT DISTRIBUTION SYSTEM, CONTENT MANAGEMENT SERVER, CONTENT-USING DEVICE, AND CONTROL METHOD

TECHNICAL FIELD

The present invention relates to a technology related to management of a content distributed via a network.

BACKGROUND ART

In recent years, business utilizing personal contents, such as the exchange of photos and video contents over Social Networking Service (SNS) websites, has been becoming more and more popular. In addition, as development of infrastructure supporting such exchange of personal contents progresses, opportunities are increasing where people belonging to a same group exchange with each other personal contents, such as photos taken at a travel destination and video contents taken at a school sports festival or a school play.

For instance, Patent Literature 1 discloses a technology as described in the following. A content management server checks, via a network, whether or not a content-using device is connected with the content management server. When the content-using device is connected with the content management server, the content management server transmits, via the network, a copy deletion command to the content-using device. The content deletion command includes a content ID corresponding to an invalidation-target content. The content-using device receives the copy deletion command from the content management server and executes deletion processing with respect to a copied content corresponding to the content ID included in the copy deletion command. In contrast, when the content-using device is not connected with the content management server, the content management server repeatedly tries to establish a connection with the content-using device until the deletion processing with respect to the copied content is completed. As such, the technology disclosed in Patent Literature 1 prevents the use of an unauthorized copied content.

CITATION LIST

Patent Literature

[Patent Literature 1]
Japanese Patent Publication No. 4186886
[Patent Literature 2]
Japanese Patent Publication No. 4463320
[Patent Literature 3]
Japanese Patent Application Publication No. 2005-250881
[Patent Literature 4]
Japanese Patent Application Publication No. 2011-138209

SUMMARY OF INVENTION

Technical Problem

However, according to the technology disclosed in Patent Literature 1, the content-using device cannot receive the copy deletion command from the content management server when the content-using device is not connected with the content management server. This gives rise to a situation where, although the content management server is instructing the content-using device to delete the copied content, the content-using device cannot actually delete the copied content. In such a case, a user of the content-using device, which is not connected with the content management server, is able to use the copied content while protection is not realized of an original content having been provided by a provider. As such, when employing the technology disclosed in Patent Literature 1, there is an imbalance between the use of a given content by a user and the right of a provider having provided the content.

In view of such a problem, the present invention provides a content distribution server, a content management server, a content-using device, and a control method according to which, regardless of whether or not a content-using device is connected with a content management server, protection of a content provided by a provider is secured while a user utilizing the content is able to use the content with an enhanced degree of convenience.

Solution to Problem

One aspect of the present invention is a content distribution system including: a content management server that manages a content; and a content-using device that uses the content, wherein the content management server comprises: a first connection detection unit that detects whether or not the content management server is connected with the content-using device; a content management unit that manages the content according to a result of the detection by the first connection detection unit and holds information on how the content-using device controls the use of the content, and the content-using device comprises: a second connection detection unit that detects whether or not the content-using device is connected with the content management server; a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and a content control unit that controls the use of the content according to the method specified by the second selection unit.

Advantageous Effects of the Invention

According to the content distribution system pertaining to one aspect of the present invention, the management of a content in the content distribution system is performed according to a method for controlling the use of the content which is determined according to whether or not the content-using device is connected with the content management server. As such, protection of the content, which has been provided by a provider, is realized while a user utilizing the content is able to use the content with an enhanced degree of convenience.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** illustrates an overall configuration of a content distribution system **40** in embodiment 1.

FIG. **2** illustrates an overall configuration of a content distribution system **10** in embodiment 2, including a configuration of a content management server **100** and a configuration of a content-using device **200**.

FIG. **3** illustrates a configuration of an online/offline detection unit **101**.

FIG. **4** illustrates a configuration of a device management unit **102**.

FIG. **5** is a chart indicating one example of a data configuration of a content-using device list **121**.

FIG. **6** is a chart indicating one example of a data configuration of an offline device list **122**.

FIG. **7** illustrates a configuration of a content management unit **103**.

FIG. **8** is a chart indicating one example of a data configuration of a content management list **131**.

FIG. **9** is a chart indicating one example of a data configuration of a content management list **131***a*.

FIG. **10** illustrates a configuration of an online/offline detection unit **201**.

FIG. **11** illustrates a configuration of a content control unit **202**.

FIG. **12** is a chart indicating one example of a data configuration of a content management list **222**.

FIG. **13** is a chart indicating one example of a data configuration of a content management list **222***a*.

FIG. **14** is the first part of a sequence diagram illustrating operations of the content distribution system **10**, a following part of which illustrated in FIG. **15**.

FIG. **15** is the second part of the sequence diagram illustrating the operations of the content distribution system **10**, a following part of which illustrated in FIG. **16**.

FIG. **16** is the third part of the sequence diagram illustrating the operations of the content distribution system **10**.

FIG. **17** is the first part of a sequence diagram illustrating operations of the content-using device **200**.

FIG. **18** is the fourth part of the sequence diagram illustrating the operations of the content distribution system **10**, a following part of which illustrated in FIG. **19**.

FIG. **19** is the fifth part of the sequence diagram illustrating the operations of the content distribution system **10**.

FIG. **20** is the second part of the sequence diagram illustrating the operations of the content-using device **200**.

FIG. **21** illustrates a configuration of a content distribution system **10***a*.

FIG. **22** is a sequence diagram illustrating interaction between a content management server **100***a* and a content-using device **200***a* in a case where the content-using device **200***a* transitions from online to offline during the interaction.

FIG. **23** is a sequence diagram illustrating interaction between the content management server **100***a* and the content-using device **200***a* in a case where, during the interaction, the content-using device **200***a* first transitions from online to offline and then returns to online once again.

FIG. **24** illustrates an overall configuration of a content distribution system **20** in embodiment 2, including a configuration of a content management server **400** and a configuration of a content-using device **500**.

FIG. **25** illustrates a screen **411** displayed by a display unit **404**.

FIG. **26** illustrates a screen **411***a* displayed by the display unit **404**.

FIG. **27** illustrates a screen **411***b* displayed by the display unit **404**.

FIG. **28** illustrates a screen **411***c* displayed by the display unit **404**.

FIG. **29** illustrates a screen **441***a* displayed by the display unit **404**.

FIG. **30** illustrates a screen **441***b* displayed by the display unit **404**.

FIG. **31** illustrates a screen **441***c* displayed by the display unit **404**.

FIG. **32** illustrates a screen **441***d* displayed by the display unit **404**.

FIG. **33** is the first part of a sequence diagram illustrating operations of the content distribution system **20**.

FIG. **34** is the second part of the sequence diagram illustrating the operations of the content distribution system **20**.

FIG. **35** illustrates operations in a case where, among contents held by one content-using device that is online, invalidation is performed of all contents having been provided from one content management server.

FIG. **36** illustrates operations in a case where, among contents held by one content-using device that is offline, invalidation is performed of all contents having been provided from one content management server.

FIG. **37** illustrates operations in a case where invalidation of one content is performed with respect to multiple content-using devices that are online.

FIG. **38** illustrates operations in a case where invalidation of one content is performed with respect to multiple content-using devices, some of which being offline and the others being online.

FIG. **39** illustrates an overall configuration of a content distribution system **30** in embodiment 4, including a configuration of a content management server **600** and a configuration of a content-using device **700**.

FIG. **40** illustrates a configuration of an online detection unit **601**.

FIG. **41** illustrates a configuration of a device management unit **602**.

FIG. **42** is a chart indicating one example of a data configuration of a content-using device list **621**.

FIG. **43** is a chart indicating one example of a data configuration of an online device list **622**.

FIG. **44** illustrates a configuration of a content management unit **603**.

FIG. **45** is a chart indicating one example of a data configuration of a content management list **631**.

FIG. **46** is a chart indicating one example of a data configuration of a content management list **631***a*.

FIG. **47** illustrates a configuration of an online notification unit **701**.

FIG. **48** illustrates a configuration of a content control unit **702**.

FIG. **49** is a chart indicating one example of a data configuration of a content management list **722**.

FIG. **50** is a chart indicating one example of a data configuration of a content management list **722***a*.

FIG. **51** is a flowchart illustrating operations involved in updating of the content management list **631** by a content management control unit **630**.

FIG. **52** is a sequence diagram illustrating operations of the content-using device **600** when receiving a polling command from the content-using device **700**.

FIG. **53** is the first part of a sequence diagram illustrating operations of the content-using device **700** when outputting a polling command, a following part of which illustrated in FIG. **54**.

FIG. **54** is the second part of the sequence diagram illustrating the operations of the content-using device **700** when outputting the polling command.

FIG. **55** is a sequence diagram illustrating operations of the content-using device **700** when determining how a content is to be used.

FIG. **56** illustrates a configuration of a content distribution system **30***a*.

FIG. **57** is the first part of a sequence diagram illustrating interaction between a content management server **600***a* and a content-using device **700***a*, a following part of which illustrated in FIG. **58**.

FIG. **58** is the second part of the sequence diagram illustrating the interaction between the content management server **600***a* and the content-using device **700***a*.

FIG. **59** is a chart indicating one example of a data configuration of a content management list **631***b*.

FIG. **60** is a chart indicating one example of a data configuration of a content management list **722***b*.

FIG. **61** illustrates one example of a data configuration of an invalidation instruction **351**.

FIG. **62** illustrates an overall configuration of a content distribution system **50** pertaining to a modification.

FIG. **63** is a sequence diagram illustrating processing in the content distribution system **50** where a relay server **950***a* transmits a polling command to a content-using device **900***a* according to an instruction from a content management server **800***a*.

FIG. **64** is a sequence diagram illustrating processing in the content distribution system **50** where the relay server **950***a* transmits the polling command to the content management server **800***a* according to an instruction from the content-using device **900***a*.

FIG. **65** is a sequence diagram illustrating processing in the content distribution system **50** where the relay server **950***a* transmits an invalidation instruction to the content-using device **900***a* according to an instruction from the content management server **800***a*.

FIG. **66** is a sequence diagram illustrating processing in the content distribution system **50** where the relay server **950***a*, in response to polling performed by the content-using device **900***a*, searches for an invalidation instruction and transmits a response to the content-using device **900***a*.

FIG. **67** is a sequence diagram illustrating operations of the content-using device **200**, which is offline, when performing self-deletion of a content before a scheduled expiration time.

FIG. **68** is a sequence diagram illustrating operations of the content-using device **200**, which is online, when performing self-deletion of a content before a scheduled expiration time.

FIG. **69** is a chart indicating one example of a data configuration of a content management list **222***b*.

DESCRIPTION OF EMBODIMENTS

One aspect of the present invention is a content distribution system including: a content management server that manages a content; and a content-using device that uses the content, wherein the content management server comprises: a first connection detection unit that detects whether or not the content management server is connected with the content-using device; a content management unit that manages the content according to a result of the detection by the first connection detection unit and holds information on how the content-using device controls the use of the content, and the content-using device comprises: a second connection detection unit that detects whether or not the content-using device is connected with the content management server; a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and a content control unit that controls the use of the content according to the method specified by the second selection unit.

According to the content distribution system pertaining to one aspect of the present invention, the management of a content in the content distribution system is performed according to a method for controlling the use of the content which is determined according to whether or not the content-using device is connected with the content management server. As such, protection of the content, which has been provided by a provider, is realized while a user utilizing the content is able to use the content with an enhanced degree of convenience.

In the content distribution system, when the second connection detection unit detects that the content-using device has transitioned from being connected with the content management server to being unconnected with the content management server, the second selection unit may specify, as the method for controlling the use of the content, a method according to a period of validity of the content, and the content control unit may set a specific period of validity with respect to the content and, when the specific period of validity of the content expires, may stop or deny the use of the content, and the first connection detection unit detects that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device, the content management unit may manage the content by using the method according to a period of validity of the content and may set a specific period of validity with respect to the content.

According to this structure, the content-using device, when self-detecting the transition from being connected with the content management server to being unconnected with the content management server, selects, as the method for controlling the use of the content, the method according to a period of validity of the content, and further, when the period of validity of the content expires, the content-using device stops or denies the use of the content. This enables a user of the content-using device to use the content during the period of validity of the content. Further, after the period of validity of the content expires, protection of the content having been provided by a provider is ensured. On the other hand, the content management server, when detecting that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device, manages the content by using the method according to a period of validity of the content and sets a period of validity with respect to the content. This enables the content management server to manage the content according to a period of validity of the content. As such, the provider of the content is freed from concerns

In the content distribution system, when the second connection detection unit detects that the content-using device has transitioned from being unconnected with the content management server to being connected with the content management server, the second selection unit may specify, as the method for controlling the use of the content, a method independent of a period of validity of the content, and the content control unit may cancel a specific period of validity set with respect to the content, and when the first connection detection unit detects that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device, the content management unit may manage the content by using the method independent of a period of validity of the content, and may cancel a specific period of validity set with respect to the content.

According to this structure, the content-using device, when self-detecting the transition from being unconnected with the content management server to being connected with the content management server, specifies, as the method for controlling the use of the content, a method independent of a period of validity of the content, and further, cancels the period of validity set with respect to the content. This enables a user to use the content. On the other hand, the content management server, when detecting that the content management server has transitioned from being unconnected with the content-

using device to being connected with the content-using device, manages the content by using the method independent of a period of validity of the content, and cancels a period of validity set with respect to the content. In this case, a provider of the content is freed from concerns since the content-using device is connected with the content management server.

In the content distribution system, when the second connection detection unit continuously detects that the content-using device is connected with the content management server, the second selection unit may continuously specify, as the method for controlling the use of the content, a method according to a period of validity of the content, and the content control unit may perform updating of extending a specific period of validity set with respect to the content, and when the first connection detection unit continuously detects that the content management server is connected with the content-using device, the content management unit may continuously manage the content by using the method according to a period of validity of the content and may perform updating of extending a specific period of validity set with respect to the content.

According to this structure, the content-using device, when continuously self-detecting that the content-using device is connected with the content management server, continuously specifies, as the method for controlling the use of the content, the method according to a period of validity of the content, and further, performs updating of extending a period of validity set with respect to the content. This enables a user to continue the use of the content. On the other hand, the content management server, when continuously detecting that the content management server is connected with the content-using device, continuously manages the content by using the method according to a period of validity of the content and performs updating of extending a period of validity set with respect to the content. In this case, the provider of the content is freed from concerns since the content-using device is connected with the content management server.

In the content distribution system, the content management server may further comprise: an invalidation reception unit that receives an invalidation instruction for invalidation of the content; an invalidation instruction transmission unit that transmits the invalidation instruction to the content-using device; and an invalidation response reception unit that receives, from the content-using device, an invalidation response as a response to the invalidation instruction, the content-using device may further comprise: an invalidation instruction reception unit that receives the invalidation instruction from the content management server when the content-using device is connected with the content management server; an invalidation unit that invalidates the content according to the invalidation instruction; and an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server, the second selection unit may specify, as the method for controlling the use of the content, a method according to a period of validity of the content when the content-using device is unconnected with the content management server, the content control unit may set a specific period of validity with respect to the content, and the invalidation unit may invalidate the content when the specific period of validity of the content expires.

According to this structure, when the content-using device is unconnected with the content management server, the content control unit specifies, as the method for controlling the use of the content, the method according to a period of validity of the content, sets a specific period of validity with respect to the content, and further, invalidates the content when the specific period of validity of the content expires. This results in protection of the content provided by a provider being ensured after the period of validity of the content expires.

In the content distribution system, the content-using device may further comprise a content deletion unit that deletes the content, the content control unit may further record information indicating deletion of the content when the content deletion unit has deleted the content, the content-using device may further comprise a notification unit that, (i) when the content-using device is connected with the content management server and the content deletion unit has deleted the content, immediately notifies the content management server of the deletion of the content and (ii) when the content-using device is unconnected with the content management server and the content deletion unit has deleted the content, notifies the content management server of the deletion of the content after the content-using device is connected with the content management server, and the content management unit may further record information indicating the deletion of the content.

According to this structure, the content-using device, when connected with the content management server, immediately notifies the content management server that the content has been deleted. On the other hand, the content-using device, when unconnected with the content management server, notifies the content management server that the content has been deleted after detecting the transition from being unconnected with the content management server to being connected with the content management server. This enables the content management server to acknowledge that the content has been self-deleted by the content-using device.

Another aspect of the present invention is a content management server managing a content and providing the content to a content-using device, comprising: a first connection detection unit that detects whether or not the content management server is connected with the content-using device; and a content management unit that manages the content according to a result of the detection by the first connection detection unit and holds information on how the content-using device controls the use of the content.

According to the content management server pertaining to one aspect of the present invention, the management of a content is performed according to a method for controlling the use of the content which is determined according to whether or not the content management server is connected with the content-using device. This results in protection of the content, which has been provided by a provider, being realized while a user utilizing the content is able to use the content with an enhanced degree of convenience.

In the content management server, when the first connection detection unit detects that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device, the content management unit may manage the content by using a method according to a period of validity of the content and may set a specific period of validity with respect to the content.

According to this structure, the content management server, when detecting that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device, manages the content according to the method according to a period of validity of the content and sets a specific period of validity with respect to the content. This enables the content management server to manage the content according to a

period of validity of the content. As such, a provider of the content is freed from concerns.

In the content management server, when the first connection detection unit detects that the content management server has transitioned from being unconnected with the content-using device to being connected with the content-using device, the content management unit may manage the content by using a method independent of a period of validity of the content, and may cancel the specific period of validity set with respect to the content.

According to this structure, the content management server, when detecting that the content management server has transitioned from being unconnected with the content-using device to being connected with the content-using device, manages the content by using the method independent of a period of validity of the content, and cancels the specific period of validity set with respect to the content in the content management server. In this case, a provider of the content is freed from concerns since the content-using device is connected with the content management server.

In the content management server, when the first connection detection unit continuously detects that the content management server is connected with the content-using device, the content management unit may continuously manage the content by using a method according to a period of validity of the content and may perform updating of extending a specific period of validity set with respect to the content.

According to this structure, the content management server, when continuously detecting that the content management server is connected with the content-using device, continuously manages the content by using the method according to a period of validity of the content and performs updating of extending a specific period of validity set with respect to the content. In this case, a provider of the content is freed from concerns since the content-using device is connected with the content management server.

In the content management server, the first connection detection unit may perform polling with respect to the content-using device at a predetermining timing, may detect that the content management server is connected with the content-using device when receiving a polling response from the content-using device in response to the polling, and may detect that the content management server is unconnected with the content-using device when the polling response is not received from the content-using device within a predetermined interval.

According to this structure, the content management server detects whether or not the content management server is connected with the content-using device according to reception or non-reception of a polling response from the content-using device.

In the content management server, the first connection detection unit may determine the predetermined timing according to a period of validity of the content.

According to this structure, the content management server determines the predetermined timing at which polling is performed with respect to the content-using device according to a period of validity of the content. This enables effectively determining the timing at which polling is performed.

In the content management server, the first connection detection unit, when receiving a polling signal from the content-using device at a predetermined timing, may detect that that the content management server is connected with the content-using device, and may transmit a polling response to the content-using device.

According to this structure, the content management server detects whether or not the content management server is connected with the content-using device according to polling performed by the content-using device with respect to the content management server. As such, the content management server need not check whether or not a connection is established between the content management server and the content-using device.

In the content management server, the first connection detection unit may detect that the content management server is connected with the content-using device when receiving a notification from the content-using device that the content-using device is connected with the content management server.

According to this structure, the content management server detects that the content management server is connected with the content-using device when receiving a notification from the content-using device that the content-using device is connected with the content management server. As such, the content management server need not check whether or not a connection is established between the content management server and the content-using device.

The content management server may further comprise: an invalidation reception unit that receives an invalidation instruction for invalidation of the content; an invalidation instruction transmission unit that transmits the invalidation instruction to the content-using device; and an invalidation response reception unit that receives, from the content-using device, an invalidation response as a response to the invalidation instruction.

According to this structure, the content management server transmits an invalidation instruction for invalidation of a content to the content-using device and receives, from the content-using device, an invalidation response as a response to the invalidation instruction. As such, the content management server causes the content-using device to perform invalidation of the content.

The content management server may further comprise a display unit that displays a status of the invalidation of the content performed in accordance with the invalidation instruction by referring to the invalidation response received from the content-using device, wherein the display unit, (i) may display invalidation completion information indicating that the invalidation of the content has been completed by the content-using device, when connected with the content management server, and, (ii) may display a period of validity of the content set in the content-using device, when unconnected with the content management server.

According to this structure, the content management server displays invalidation completion information indicating that the invalidation of the content has been completed by the content-using device, when connected with the content management server. Further, the content management server displays a period of validity of the content set in the content-using device, when unconnected with the content management server. As such, a provider of the content is acknowledged of the status of the invalidation of the content.

The content management server may further comprise a display unit that displays how the management of the content is being performed.

According to this structure, the content management server displays how the management of the content is being performed. As such, a provider of the content is acknowledged of how the management of the content is being performed.

Another aspect of the present invention is a content-using device that uses a content provided from a content management server managing the content, comprising: a second connection detection unit that detects whether or not the content-using device is connected with the content management

server; a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and a content control unit that controls the use of the content according to the method specified by the second selection unit.

According to the content-using device pertaining to one aspect of the present invention, the management of a content is performed according to a method for controlling the use of the content which is determined according to whether or not the content-using device is connected with the content management server. This results in protection of the content, which has been provided by a provider, being realized while a user utilizing the content is able to use the content with an enhanced degree of convenience.

In the content-using device, when the second connection detection unit detects that the content-using device has transitioned from being connected with the content management server to being unconnected with the content management server, the second selection unit may specify, as the method for controlling the use of the content, a method according to a period of validity of the content, and the content control unit may set a specific period of validity with respect to the content and, when the specific period of validity of the content expires, may stop or deny the use of the content.

According to this structure, the content-using device, when self-detecting the transition from being connected with the content management server to being unconnected with the content management server, selects, as the method for controlling the use of the content, the method according to a period of validity of the content. Further, when the period of validity of the content expires, the content-using device stops or denies the use of the content. This enables a user of the content-using device to use the content during the period of validity of the content. Further, after the period of validity of the content expires, protection of the content having been provided by a provider is ensured.

In the content-using device, when the second connection detection unit detects that the content-using device has transitioned from being unconnected with the content management server to being connected with the content management server, the second selection unit may specify, as the method for controlling the use of the content, a method independent of a period of validity of the content, and the content control unit may cancel a specific period of validity set with respect to the content.

According to this structure, the content-using device, when self-detecting the transition from being unconnected with the content management server to being connected with the content management server, specifies, as the method for controlling the use of the content, a method independent of a period of validity of the content, and further, cancels the period of validity set with respect to the content. This enables a user to use the content.

In the content-using device, when the second connection detection unit continuously detects that the content-using device is connected with the content management server, the second selection unit may continuously specify, as the method for controlling the use of the content, a method according to a period of validity of the content, and the content control unit may perform updating of extending a specific period of validity set with respect to the content.

According to this structure, the content-using device, when continuously self-detecting that the content-using device is connected with the content management server, continuously specifies, as the method for controlling the use of the content, the method according to a period of validity of the content, and further, performs updating of extending a period of validity set with respect to the content. As such, a user is able to continue the use of the content.

In the content-using device, the second connection detection unit may detect whether or not the content-using device is connected with the content management server by performing either one of or any combination of: (i) detecting, at a predetermined timing, whether or not a polling signal is received from the content management server at the predetermining timing; (ii) detecting whether or not a communication module provided to the content-using device is activated; (iii) detecting whether or not the content-using device is located within a distance, from an access point, within which radio signals from the content-using device reach the access point; and (iv) detecting whether a user operation is performed with respect to the content-using device for activating or deactivating communication by the content-using device.

According to this structure, the content-using device detects whether or not the content-using device is connected with the content management server in various ways including detecting polling, detecting whether or not a communication module is activated, detecting whether or not the content-using device is located within a distance within which radios signals are reachable, and detecting a user operation performed with respect to the content-using device for activating/deactivating communication.

In the content-using device, the second connection detection unit, when detecting that the content-using device is connected with the content management server, may perform polling with respect to the content management server and may receive a polling response from the content management server as a response to the polling, and the content control unit, when the polling response permits extension of a period of validity set with respect to the content, may perform updating of extending the period of validity.

According to this structure, the content-using device performs polling with respect to the content management server, and when a polling response received as a response to the polling permits extension of a period of validity set with respect to the content, performs updating of extending the period of validity set with respect to the content. As such, a user of the content-using device is able to continue the use of the content.

In the content-using device, the second connection detection unit may determine a timing at which the polling is performed according to the period of validity.

According to this structure, the content-using device determines the predetermined timing at which polling is performed with respect to the content management server according to a period of validity of the content set in the content-using device. This enables effectively determining the timing at which polling is performed.

In the content-using device, the second connection detection unit, when detecting that the content-using device is connected with the content management server, may transmit a notification to the content management server that the content-using device is connected with the content management server, and the second connection detection unit may detect whether or not the content-using device is connected with the content management server by performing either one of or any combination of: (i) detecting, at a predetermined timing, whether or not a polling signal is received from the content management server at the predetermining timing; (ii) detecting whether or not a communication module provided to the content-using device is activated; (iii) detecting whether or not the content-using device is located within a distance, from an access point, within which radio signals from the content-

using device reach the access point; and (iv) detecting whether a user operation is performed with respect to the content-using device for activating or deactivating communication by the content-using device.

According to this structure, the content-using device detects whether or not the content-using device is connected with the content management server in various ways including the detection of polling, detecting whether or not a communication module is activated, detecting whether or not the content-using device is located within a distance within which radios signals are reachable, and detecting a user operation performed with respect to the content-using device for activating/deactivating communication, and, when detecting that the content-using device is connected with the content management server, transmits a notification to the content management server that the content-using device is connected with the content management server.

The content-using device may further comprise: an invalidation instruction reception unit that receives an invalidation instruction from the content management server when the content-using device is connected with the content management server; an invalidation unit that invalidates the content according to the invalidation instruction; and an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server.

According to this structure, the content-using device receives an invalidation instruction for invalidation of the content from the content management server and invalidates the content. This results in protection of the content being ensured.

The content-using device may further comprise: a display unit that displays a record of the invalidation of the content performed according to the invalidation instruction when the invalidation unit has invalidated the content.

According to this structure, the content-using device displays a record of the invalidation of the content when the invalidation unit has invalidated the content. As such, a user is acknowledged of a record of the invalidation of the content.

The content-using device may further comprise a display unit that displays how the control of the use of the content is being performed by the content control unit.

According to this structure, the content-using device displays how the control of the use of the content is being performed by the content control unit. As such, a user is acknowledged of how the control is being performed.

The content-using device may further comprise: an invalidation instruction reception unit that receives an invalidation instruction from the content management server when the content-using device is connected with the content management server; an invalidation unit that invalidates the content according to the invalidation instruction; an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server, wherein the second selection unit may specify, as the method for controlling the use of the content, a method according to a period of validity of the content when the content-using device is unconnected with the content management server, the content control unit may set a specific period of validity with respect to the content, and the invalidation unit may invalidate the content when the specific period of validity of the content expires.

According to this structure, when the content-using device is unconnected with the content management server, the content control unit specifies, as the method for controlling the use of the content, the method according to a period of validity of the content, sets a specific period of validity with respect to the content, and further, invalidates the content when the specific period of validity of the content expires. This results in protection of the content provided by a provider being ensured after the period of validity of the content expires.

The content-using device may further comprise a content deletion unit that deletes the content, wherein the content control unit may further record information indicating deletion of the content when the content deletion unit has deleted the content, the content-using device may further comprise: a notification unit that, (i) when the content-using device is connected with the content management server and the content deletion unit has deleted the content, immediately notifies the content management server of the deletion of the content and, (ii) when the content-using device is unconnected with the content management server and the content deletion unit has deleted the content, notifies the content management server of the deletion of the content after the content-using device is connected with the content management server.

According to this structure, the content-using device, when connected with the content management server, immediately notifies the content management server that the content has been deleted. On the other hand, the content-using device, when unconnected with the content management server, notifies the content management server that the content has been deleted after detecting the transition from being unconnected with the content management server to being connected with the content management server. As such, the content management server is able to acknowledge that the content has been self-deleted by the content-using device.

Another aspect of the present invention is a control method used in a content distribution system including: a content management server that manages a content; and a content-using device that uses the content, comprising: a first connection detection step, by the content management server, of detecting whether or not the content management server is connected with the content-using device; a content management step, by the content management server, of managing the content according to a result of the detection in the first connection detection step and of holding information on how the content-using device controls the use of the content; a second connection detection step, by the content-using device, of detecting whether or not the content-using device is connected with the content management server; a second selection step, by the content-using device, of specifying a method for controlling the use of the content according to a result of the detection in the second connection detection step; and a content control step, by the content-using device, of controlling the use of the content according to the method specified in the second selection step.

According to the control method pertaining to one aspect of the present invention, the management of a content in the content distribution system is performed according to a method for controlling the use of the content which is determined according to whether or not the content-using device is connected with the content management server. This results in protection of the content, which has been provided by a provider, being realized while a user utilizing the content is able to use the content with an enhanced degree of convenience.

Another aspect of the present invention is an integrated circuit that forms a content management server managing a content and providing the content to a content-using device, comprising: a first connection detection unit that detects whether or not the content management server is connected with the content-using device; and a content management unit

that manages the content according to a result of the detection by the first connection detection unit and holds information on how the content-using device controls the use of the content.

According to the integrated circuit pertaining to one aspect of the present invention, the management of a content is performed according to a method for controlling the use of the content which is determined according to whether or not the content management server is connected with the content-using device. This results in protection of the content, which has been provided by a provider, being realized while a user utilizing the content is able to use the content with an enhanced degree of convenience.

Another aspect of the present invention is an integrated circuit that forms a content-using device that uses a content provided from a content management server managing the content, comprising: a second connection detection unit that detects whether or not the content-using device is connected with the content management server; a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and a content control unit that controls the use of the content according to the method specified by the second selection unit.

According to the integrated circuit pertaining to one aspect of the present invention, the management of a content is performed according to a method for controlling the use of the content which is determined according to whether or not the content-using device is connected with the content management server. This results in, protection of the content, which has been provided by a provider, being realized while a user utilizing the content is able to use the content with an enhanced degree of convenience.

1. Embodiment 1

In the following, description is provided on a content distribution system **40** pertaining to embodiment 1 of the present invention, with reference to the accompanying drawings.

(1) Configuration of Content Distribution System **40**

FIG. **1** illustrates an overall configuration of the content distribution system **40**. The content distribution system **40** includes a content management server **800** and a content-using device **900**.

The content management server **800** manages a content. The content-using device **900** uses the content.

The content management server **800** comprises: a first connection detection unit **802**; and a content management unit **801**. The first connection detection unit **802** detects whether or not the content management server **800** is connected with the content-using device **900**. The content management unit **801** manages the content according to a result of the detection by the first connection detection unit **802**. The content management unit **801** holds information on how the content-using device **900** controls the use of the content.

The content-using device **900** comprises: a second connection detection unit **901**; a second selection unit **903**; and a content control unit **902**. The second connection detection unit **901** detects whether or not the content-using device **900** is connected with the content management server **800**. The second selection unit **903** specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit **901**. The content control unit **902** controls the use of the content according to the method specified by the second selection unit **903**.

Conclusion

According to the configuration of the content distribution system **40** pertaining to embodiment 1, the management of a content in the content distribution system **40** is performed according to a method for controlling the use of the content which is determined according to whether or not the content-using device **900** is connected with the content management server **800**. As such, protection of the content, which has been provided by a provider, is realized while a user utilizing the content is able to use the content with an enhanced degree of convenience.

(2) When the second connection detection unit **901** detects that the content-using device **900** has transitioned from being connected with the content management server **800** to being unconnected with the content management server **800**, the second selection unit **903** may specify, as the method for controlling the use of the content, a method according to a period of validity of the content, and the content control unit **902** may set a specific period of validity with respect to the content and, when the specific period of validity of the content expires, may stop or deny the use of the content.

When the first connection detection unit **802** detects that the content management server **800** has transitioned from being connected with the content-using device **900** to being unconnected with the content-using device **900**, the content management unit **801** may manage the content by using the method according to a period of validity of the content and may set a specific period of validity with respect to the content.

(3) When the second connection detection unit **901** detects that the content-using device **900** has transitioned from being unconnected with the content management server **800** to being connected with the content management server **800**, the second selection unit **903** may specify, as the method for controlling the use of the content, a method independent of a period of validity of the content, and the content control unit **902** may cancel a specific period of validity set with respect to the content.

When the first connection detection unit **802** detects that the content management server **800** has transitioned from being unconnected with the content-using device **900** to being connected with the content-using device **900**, the content management unit **801** may manage the content by using the method independent of a period of validity of the content, and may cancel a specific period of validity set with respect to the content.

(4) When the second connection detection unit **901** continuously detects that the content-using device **900** is connected with the content management server **800**, the second selection unit **903** may continuously specify, as the method for controlling the use of the content, a method according to a period of validity of the content, and the content control unit **902** may perform updating of extending a specific period of validity set with respect to the content.

When the first connection detection unit **802** continuously detects that the content management server **800** is connected with the content-using device **900**, the content management unit **801** may continuously manage the content by using the method according to a period of validity of the content and may perform updating of extending a specific period of validity set with respect to the content.

(5) The content management server **800** may further comprise: an invalidation reception unit that receives an invalidation instruction for invalidation of the content; an invalidation instruction transmission unit that transmits the invalidation instruction to the content-using device **900**; and an invalidation response reception unit that receives, from the content-using device **900**, an invalidation response as a response to the invalidation instruction.

The content-using device **900** may further comprise: an invalidation instruction reception unit that receives the invalidation instruction from the content management server **800** when the content-using device **900** is connected with the content management server **800**; an invalidation unit that invalidates the content according to the invalidation instruction; and an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server **800**.

The second selection unit **903** may specify, as the method for controlling the use of the content, a method according to a period of validity of the content when the content-using device **900** is unconnected with the content management server **800**, the content control unit **902** may set a specific period of validity with respect to the content, and the invalidation unit may invalidate the content when the specific period of validity of the content expires.

(6) The content-using device **900** may further comprise a content deletion unit that deletes the content.

The content control unit **902** may further record information indicating deletion of the content when the content deletion unit has deleted the content.

The content-using device **900** may further comprise a notification unit that, (i) when the content-using device **900** is connected with the content management server **800** and the content deletion unit has deleted the content, immediately notifies the content management server **800** of the deletion of the content and (ii) when the content-using device **900** is unconnected with the content management server **800** and the content deletion unit has deleted the content, notifies the content management server **800** of the deletion of the content after the content-using device **900** is connected with the content management server **800**.

The content management unit **801** may further record the deletion of the content.

(7) One aspect of the present invention is the content management server **800** managing a content and providing the content to the content-using device **900**. As illustrated in FIG. **1**, the content management server **800** comprises: the first connection detection unit **802** that detects whether or not the content management server **800** is connected with the content-using device **900**; and the content management unit **801** that manages the content according to a result of the detection by the first connection detection unit **802** and holds information on how the content-using device **900** controls the use of the content.

(8) When the first connection detection unit **802** detects that the content management server **800** has transitioned from being connected with the content-using device **900** to being unconnected with the content-using device **900**, the content management unit **801** may manage the content by using a method according to a period of validity of the content and may set a specific period of validity with respect to the content.

(9) When the first connection detection unit **802** detects that the content management server **800** has transitioned from being unconnected with the content-using device **900** to being connected with the content-using device **900**, the content management unit **801** may manage the content by using a method independent of a period of validity of the content, and may cancel a specific period of validity set with respect to the content.

(10) When the first connection detection unit **802** continuously detects that the content management server **800** is connected with the content-using device **900**, the content management unit **801** may continuously manage the content by using the method according to a period of validity of the content and may perform updating of extending a specific period of validity set with respect to the content.

(11) The first connection detection unit **802** may perform polling with respect to the content-using device **900** at a predetermining timing, may detect that the content management server **800** is connected with the content-using device **900** when receiving a polling response from the content-using device **900** in response to the polling, and may detect that the content management server **800** is unconnected with the content-using device **900** when the polling response is not received from the content-using device **900** within a predetermined interval.

(12) The first connection detection unit **802** may determine the predetermined timing according to a period of validity of the content.

(13) The first connection detection unit **802**, when receiving a polling signal from the content-using device **900** at a predetermined timing, may detect that the content management server **800** is connected with the content-using device **900**, and may transmit a polling response to the content-using device **900**.

(14) The first connection detection unit **802** may detect that the content management server **800** is connected with the content-using device **900** when receiving a notification from the content-using device **900** that the content-using device **900** is connected with the content management server **800**.

(15) The content management server **800** may further comprise: an invalidation reception unit that receives an invalidation instruction for invalidation of the content; an invalidation instruction transmission unit that transmits the invalidation instruction to the content-using device **900**; and an invalidation response reception unit that receives, from the content-using device **900**, an invalidation response as a response to the invalidation instruction.

(16) The content management server **800** may further comprise a display unit that displays a status of the invalidation of the content performed according to the invalidation instruction by referring to the invalidation response received from the content-using device **900**. The display unit, (i) may display invalidation completion information indicating that the invalidation of the content has been completed by the content-using device **900**, when connected with the content management server **800**, and, (ii) may display a period of validity of the content set in the content-using device **900**, when unconnected with the content management server **800**.

(17) The content management server **800** may further comprise a display unit that displays how the management of the content is being performed.

(18) One aspect of the present invention is the content-using device **900** that uses a content provided from the content management server **800** managing the content.

As illustrated in FIG. **1**, the content-using device **900** comprises: the second connection detection unit **901** that detects whether or not the content-using device **900** is connected with the content management server **800**; the second selection unit **903** that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit **901**; and the content control unit **902** that controls the use of the content according to the method specified by the second selection unit **903**.

(19) When the second connection detection unit **901** detects that the content-using device **900** has transitioned from being connected with the content management server **800** to being unconnected with the content management server **800**, the second selection unit **903** specifies, as a method for controlling the use of the content, a method

according to a period of validity of the content, and the content control unit **902** may set a specific period of validity with respect to the content and, when the specific period of validity of the content expires, may stop or deny the use of the content.

(20) When the second connection detection unit **901** detects that the content-using device **900** has transitioned from being unconnected with the content management server **800** to being connected with the content management server **800**, the second selection unit **903** may specify, as the method for controlling the use of the content, a method independent of a period of validity of the content, and the content control unit **902** may cancel a specific period of validity set with respect to the content.

(21) When the second connection detection unit **901** continuously detects that the content-using device **900** is connected with the content management server **800**, the second selection unit **903** may continuously specify, as the method for controlling the use of the content, a method according to a period of validity of the content, and the content control unit **902** may perform updating of extending a specific period of validity set with respect to the content.

(22) The second connection detection unit **901** may detect whether or not the content-using device **900** is connected with the content management server **800** by performing either one of or any combination of: (i) detecting, at a predetermined timing, whether or not a polling signal is received from the content management server **800** at the predetermining timing; (ii) detecting whether or not a communication module provided to the content-using device **900** is activated; (iii) detecting whether or not the content-using device **900** is located within a distance, from an access point, within which radio signals from the content-using device **900** reach the access point; and (iv) detecting whether a user operation is performed with respect to the content-using device **900** for activating or deactivating communication by the content-using device **900**.

(23) The second connection detection unit **901**, when detecting that the content-using device **900** is connected with the content management server **800**, may perform polling with respect to the content management server **800** and may receive a polling response from the content management server **800** as a response to the polling.

The content control unit **902**, when the polling response permits extension of a period of validity set with respect to the content, may perform updating of extending the period of validity.

(24) The second connection detection unit **901** may determine a timing at which the polling is performed according to the period of validity.

(25) The second connection detection unit **901**, when detecting that the content-using device **900** is connected with the content management server **800**, may transmit a notification to the content management server **800** that the content-using device **900** is connected with the content management server **800**.

The second connection detection unit **901** may detect whether or not the content-using device **900** is connected with the content management server **800** by performing either one of or any combination of: (i) detecting, at a predetermined timing, whether or not a polling signal is received from the content management server **800** at the predetermining timing; (ii) detecting whether or not a communication module provided to the content-using device **900** is activated; (iii) detecting whether or not the content-using device **900** is located within a distance, from an access point, within which radio signals from the content-using device **900** reach the access point; and (iv) detecting whether a user operation is performed with respect to the content-using device **900** for activating or deactivating communication by the content-using device **900**.

(26) The content-using device **900** may further comprise: an invalidation instruction reception unit that receives an invalidation instruction from the content management server **800** when the content-using device **900** is connected with the content management server **800**; an invalidation unit that invalidates the content according to the invalidation instruction; and an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server **800**.

(27) The content-using device **900** may further comprise: a display unit that displays a record of the invalidation of the content performed according to the invalidation instruction when the invalidation unit has invalidated the content.

(28) The content-using device **900** may further comprise a display unit that displays how the control of the use of the content is being performed by the content control unit **902**.

(29) The content-using device **900** may further comprise: an invalidation instruction reception unit that receives the invalidation instruction from the content management server **800** when the content-using device **900** is connected with the content management server **800**; an invalidation unit that invalidates the content according to the invalidation instruction; and an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server **800**.

The second selection unit **903** may specify, as the method for controlling the use of the content, a method according to a period of validity of the content when the content-using device **900** is unconnected with the content management server **800**, the content control unit **902** may set a specific period of validity with respect to the content.

The invalidation unit may invalidate the content when the specific period of validity of the content expires.

(30) The content-using device **900** may further comprise a content deletion unit that deletes the content.

The content control unit **902** may further record information indicating deletion of the content when the content deletion unit has deleted the content.

The content-using device **900** may further comprise a notification unit that, (i) when the content-using device **900** is connected with the content management server **800** and the content deletion unit has deleted the content, immediately notifies the content management server **800** of the deletion of the content and (ii) when the content-using device **900** is unconnected with the content management server **800** and the content deletion unit has deleted the content, notifies the content management server **800** of the deletion of the content after the content-using device **900** is connected with the content management server **800**.

(31) One aspect of the present invention is control method used in the content distribution system **40** including: the content management server **800** that manages a content; and the content-using device **900** that uses the content.

The control method comprises: a first connection detection step, by the content management server **800**, of detecting whether or not the content management server **800** is connected with the content-using device **900**; a content management step, by the content management server **800**, of managing the content according to a result of the detection in the first connection detection step and of holding information on how the content-using device **900** controls the use of the content; a second connection detection step, by the content-using

device **900**, of detecting whether or not the content-using device **900** is connected with the content management server **800**; a second selection step, by the content-using device **900**, of specifying a method for controlling the use of the content according to a result of the detection in the second connection detection step; and a content control step, by the content-using device **900**, of controlling the use of the content according to the method specified in the second selection step.

(32) One aspect of the present invention is an integrated circuit that forms the content management server **800** managing a content and providing the content to the content-using device **900**.

The integrated circuit comprises: a first connection detection unit that detects whether or not the content management server **800** is connected with the content-using device **900**; and a content management unit that manages the content according to a result of the detection by the first connection detection unit and holds information on how the content-using device **900** controls the use of the content.

(33) One aspect of the present invention is an integrated circuit that forms the content-using device **900** that uses a content provided from the content management server **800** managing the content.

The integrated circuit comprises: a second connection detection unit that detects whether or not the content-using device **900** is connected with the content management server **800**; a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and a content control unit that controls the use of the content according to the method specified by the second selection unit.

2. Embodiment 2

In the following, description is provided on a content distribution system **10** pertaining to embodiment 2 of the present invention, with reference to the accompanying drawings.

2.1 Configuration of Content Distribution System **10**

FIG. **2** illustrates an overall configuration of the content distribution system **10**. The content distribution system **10** includes: a content management server **100**; a content-using device **200**; and a communication path **300** between the content management server **100** and the content-using device **200**. The communication path **300** may be an IP communication network or a non-IP communication network, may be a wireline communication network or a wireless communication network, and may include one or more communication devices such as a router interposed between the content management server **100** and the content-using device **200**. The content distribution system **10** may include two or more content management servers and two or more content-using devices. When multiple content management servers and multiple content-using devices are included in the content distribution system **10**, the content management servers and the content-using devices may be interconnected via a network.

2.2 Configuration of Content Management Server **100**

FIG. **2** also illustrates a configuration of the content management server **100**. The content management server **100** includes: an online/offline detection unit **101**; a device management unit **102**; a content management unit **103**; and a time measurement unit **104**.

Commonly, the content management server **100** is implemented as an embedded device such as a PC and a video recorder. An embedded device such as a PC and a video recorder includes: a CPU; a memory; a secondary storage device; and a network interface. In the content management server **100**, when implemented as such an embedded device, the online/offline detection unit **101** is implemented as a combination of the network interface, the CPU, and a program that operates on the CPU. Similarly, the device management unit **102** is implemented as a combination of the CPU, the memory, and a program that operates on the CPU. Similarly, the content management unit **103** is implemented as a combination of the CPU, the secondary storage device, and a program that operates on the CPU, and the time measurement unit **104** is commonly implemented as a combination of hardware such as a timer and software for controlling the hardware. However, as a matter of course, the content management server **100** pertaining to the present embodiment is not limited to being implemented in such a manner.

2.2.1 Online/Offline Detection Unit **101**

FIG. **3** illustrates a configuration of the online/offline detection unit **101**. The online/offline detection unit **101** detects that a device (a content-using device) has transitioned from a state of being connected with the content management server **100** (hereinafter a content-using device, when in such a state, is referred to as being "online" or as an "online content-using device") to a state of being unconnected with the content management server **100** (hereinafter a content-using device, when in such a state, is referred to as being "offline" or as an "offline content-using device"). The online/offline detection unit **101** also detects that the content-using device has transitioned from offline to online. More specifically, the online/offline detection unit **101** includes: a polling transmission unit **110**; an online/offline control determination unit **112**; a polling Ack reception unit **111**; and an online control reception unit **113**.

The following provides specific description on how the online/offline detection unit **101** detects whether the content-using device is online or offline.

First, the online/offline control determination unit **112** notifies the polling transmission unit **110** of an address of the content-using device. The polling transmission unit **110** receives the address and transmits a polling command to the address via the communication path **300**. For instance, the transmission of the polling command is realized by ping in an IP network. Ping is a software for testing the reachability of a target node on an IP network. When utilizing ping, an Internet Control Message Protocol (ICMP) "echo request" packet is transmitted to a target node. Further, the reachability of the target node is confirmed by an "echo reply" being returned from the target node as a response packet (a polling Ack). With regards to the polling performed by the polling transmission unit **110**, the polling transmission unit **110** performs the polling at regular intervals by being instructed by the online/offline control determination unit **112**. For instance, the polling is performed at hourly intervals.

The polling Ack reception unit **111** receives a polling Ack returned from the target node (i.e., the polling-target content-using device) as a response to the polling command. When the polling Ack reception unit **111** receives the polling Ack, the online/offline control determination unit **112** determines that the target node is online. In contrast, when the polling Ack reception unit **111** does not receive the polling Ack even after elapse of a predetermined interval following the transmission of the polling command (i.e., in cases of "timeout"), the online/offline control determination unit **112** determines that the target node is offline. The online/offline detection unit **101** transmits, at regular intervals, a polling command to each content-using device to which a content possessed by the content management server **100** has been distributed. By performing the polling in such a manner, the online/offline

detection unit **101** detects whether each content-using device is online or offline. Further, the online/offline detection unit **101** notifies the device management unit **102** of a result of the detection, along with a detection time point at which the detection has been performed.

As described above, in an IP network for instance, a given device is determined as being online when, by utilizing ping, an "echo request" (i.e., a polling command) is transmitted to the device and an "echo reply" (i.e., a polling Ack (response)) corresponding to the "echo request" is returned from the device in response. In contrast, a given device is determined as being offline when, an "echo reply" (i.e., a polling Ack (response)) corresponding to an "echo request" having been transmitted to the device is not returned from the device.

The online control reception unit **113** also receives a notification signal from a content-using device that self-detects a transition from offline to online. Hereinafter, the notification signal transmitted and received in such a case may also be referred to as an "online control signal". When the online control reception unit **113** receives an online control signal from a content-using device **200**, the content management server **100** determines that the content-using device **200** is online.

Once determining that the content-using device **200** is offline, the content management server **100** stops performing online/offline detection, which involves performing the polling at regular intervals, with respect to the content-using device **200**.

2.2.2 Device Management Unit **102**

FIG. **4** illustrates a configuration of the device management unit **102**. The device management unit **102** includes: a device management control unit **120**; and a device list storage unit **123**. The device list storage unit **123** holds a content-using device list **121** and an offline device list **122**.

The device management control unit **120** controls the writing, the reading out, and the deleting of content-using device information with respect to the content-using device list **121**. The device management control unit **120** also controls the writing, the reading out, and the deleting of offline device information with respect to the offline device list **122**. In addition, when, for instance, receiving an invalidation instruction for invalidating playback of a content, the device management control unit **120** reads out, from the content-using device list **121**, an IP address indicating a connection destination of a content-using device corresponding to the invalidation instruction. Further, when it is detected that a content-using device has transitioned from online to offline as a result of the online/offline detection, the device management control unit **120** adds, to the offline device list **122**, offline device information corresponding to the content-using device. Offline device information corresponding to a given content-using device includes a device name of the content-using device, etc. On the other hand, when it is detected that a content-using device has transitioned from offline to online as a result of the online/offline detection, the device management control unit **120** deletes, from the offline device list **122**, offline device information corresponding to the content-using device, which includes a device name of the content-using device, etc.

FIG. **5** is a chart indicating one example of a data configuration of the content-using device list **121**.

The content-using device list **121** is provided with areas for storing multiple content-using device information pieces. Each content-using device information piece includes, in an associated state, a content-using device name and an IP address indicating a connection destination of the content-using device. A content-using device name is identification information identifying a content-using device. As such, when a plurality of content-using device names are included in the content-using device list **121**, the content-using device names respectively indicate a plurality of content-using devices that receives a content from the content management server **100**. Further, in this example, a connection destination of a content-using device is indicated by employing an IP address indicating a location on an IP network at which the content-using device is located.

In the content-using device list **121** illustrated in FIG. **5**, a content-using device identified by "C**1**" in a content-using device name field **124** is located on the IP network at a location indicated by "192.168.1.21" in an IP address field **125**. For instance, when instructing the content-using device identified by the content-using device name "C**1**" to invalidate playback, an invalidation instruction command is transmitted to the IP address "192.168.1.21" indicated in the IP address field **125**. The same applies to content-using devices identified by content-using device names "C**2**" and "C**3**". Here, in the content-using device list **121** illustrated in FIG. **5**, a private address such as "192.168.*.*" is used to indicate an IP address. However, a global address may be used to indicate an IP address. Further, although indication of IP addresses in the content-using device list **121** illustrated in FIG. **5** is based on Internet Protocol Version 4 (IPv4), alternatively, IP addresses may be indicated based on Internet Protocol Version 6 (IPv6). In addition, taking into consideration the possibility of an address of a content-using device being changed, a domain name may be used instead of an IP address. Alternatively, also taking into consideration the possibility of an IP address of a content-using device being changed, configuration may be made such that an inquiry is made to a server managing IP addresses.

Note that, in the present disclosure, a content-using device identified by a content-using device name of "C**1**" may be simply referred to as a content-using device "C**1**". The same applies to content management servers.

FIG. **6** is a chart indicating one example of a data configuration of the offline device list **122**.

The offline device list **122** is provided with areas for storing multiple offline device information pieces. Each offline device information piece includes an offline device name and an offline detection time. An offline device name identifies a content-using device that has been determined by the online/offline detection unit **101** as being offline. An offline detection time indicates a time point at which the corresponding content-using device has been determined as being offline by the online/offline detection unit **101**.

The offline device list **122** illustrated in FIG. **6** indicates that a content-using device identified by "C**1**" in an offline device name field **126** has been determined as being offline at "1/20, 00:00" in an offline detection time field **127**. Here, "1/20, 00:00" in the offline detection time field **127** indicates 00:00, January 20th. In the following, the same format is used for indications of time.

2.2.3 Content Management Unit **103**

FIG. **7** illustrates a configuration of the content management unit **103**. The content management unit **103** includes: a content management control unit **130**; and a management list storage unit **132**. The management list storage unit **132** holds a content management list **131**.

The content management control unit **130** controls the writing, the reading out, and the deleting of management information with respect to the content management list **131**. For instance, in accordance with results of the online/offline detection, the content management control unit **130** sets, in

the content management list **131**, a scheduled expiration time as a time point at which a period of validity of a content expires.

FIG. **8** is a chart indicating one example of a data configuration of the content management list **131**.

The content management list **131** is provided with areas for storing multiple management information pieces. Each management information piece includes: one content ID; one relative validity duration; and either zero, one, or multiple usage device information pieces. That is, a management information piece includes either: (i) a combination of one content ID and one relative validity duration; (ii) a combination of one content ID, one relative validity duration, and one usage device information piece; or (iii) a combination of one content ID, one relative validity duration, and multiple usage device information pieces.

A management information piece including a combination of one content ID and one relative validity duration indicates an initial state of the management information. When a management information piece indicates an initial state, the content management server **100** has not provided a content to any content-using device. A management information piece including a combination of one content ID, one relative validity duration, and one usage device information piece indicates that the content management server **100** has provided a content to only one content-using device. A management information piece including a combination of one content ID, one relative validity duration, and multiple usage device information pieces indicates that the content management server **100** has provided a content to the same number of content-using devices as the number of usage device information pieces included.

Each usage device information piece includes one content-using device name or a combination of one content-using device name and one scheduled expiration time. That is, a usage device information piece may only include one content-using device name or may include a combination of one content-using device name and one scheduled expiration time. When a usage device information piece only includes one content-using device name, a scheduled expiration time is not set with respect to the content-using device identified by the content-using device name. When a usage device information piece includes a combination of one content-using device name and one scheduled expiration time, a scheduled expiration time is set with respect to the content-using device identified by the content-using device name.

A content ID uniquely identifies a corresponding content. A relative validity duration indicates a relative duration during which use, by an offline content-using device, of a content identified by the corresponding content ID is permitted. Such a relative duration as described above is referred to as a relative validity duration.

A content-using device name is a name identifying a content-using device. A scheduled expiration time is included in a usage device information piece when a content-using device identified by the corresponding content-using device name is offline, and indicates a time point at which a period of validity of the content expires. Here, the content is referred to as being valid when use of the content by the offline content-using device is permitted.

The content management list **131** illustrated in FIG. **8** indicates that "24H", as indicated in a relative validity duration field **134**, is set as a relative validity duration of a content identified by "Cont **1**" in a content ID field **133**. Here, "24H" indicates a time period of twenty-four hours. The content management list **131** illustrated in FIG. **8** also indicates that the content "Cont**1**" is being used by two content-using devices each indicated by "C**1**" in a content-using device name field **135** and "C**2**" in a content-using device name field **136**.

The content management list **131** illustrated in FIG. **8** indicates that "1/21, 00:00", as indicated in a scheduled expiration time field **137**, is set as a scheduled expiration time with respect to the content-using device indicated by "C**1**" in the content-using device name field **135**. As such, the content-using device "C**1**" is currently offline and the period of validity of the content "Cont**1**" with respect to the content-using device "C**1**" expires at 00:00, January 21st. Here, while a content is valid with respect to a given content-using device, the content using device is permitted to use the content. This time point at which the validity of the content "Cont**1**" expires is calculated by adding "24H" indicated in the relative validity duration field **134** to "1/20, 00:00" indicated in the offline detection time field **127** illustrated in FIG. **6**. The indication of "1/21, 00:00" in the scheduled expiration time field **137** indicates that the period of validity of the content "Cont**1**" with respect to the content-using device "C**1**" expires at this time point, if not sooner.

Scheduled Expiration Time=Offline Detection Time+ Relative Validity Duration

The content management list **131** illustrated in FIG. **8** indicates that a scheduled expiration time is not set with respect to the content-using device indicated by "C**2**" in the content-using device name field **136**. As such, the content-using device "C**2**" is currently online and a specific period of validity of the content "Cont**1**" with respect to the content-using device "C**2**" is not set. In the content management list **131** illustrated in FIG. **8**, an indication of "---" is provided in a scheduled expiration time field **138**, which indicates that a scheduled expiration time is not set.

The content management list **131** illustrated in FIG. **8** indicates that "48H", as indicated in a relative validity duration field **140**, is set as a relative validity duration of a content identified by "Cont**2**" in a content ID field **139**. The content management list **131** illustrated in FIG. **8** also indicates that the content "Cont**2**" is being used by two content-using devices each indicated by "C**1**" in a content-using device name field **141** and "C**3**" in a content-using device name field **142**. Here, "48H" indicates a time period of forty-eight hours. The content-using device "C**1**" is currently offline, and "1/21, 00:00", as indicated in a scheduled expiration time field **143**, is set as a scheduled expiration time with respect to the content-using device "C**1**". The content-using device "C**3**" is currently online.

FIG. **9** is a chart indicating one example of a data configuration of a content management list **131***a*, which is another example of the content management list **131**. In specific, the content management list **131***a* indicates a state of the content management list **131** after the content-using device "C**1**", which is offline in the content management list **131** illustrated in FIG. **8**, has transitioned from offline to online. The content management list **131***a* indicates that each of the content-using devices "C**1**", "C**2**", and "C**3**" is currently online. Further, the content management list **131***a* indicates that a scheduled expiration time is not set with respect to any of the content-using devices "C**1**", "C**2**", and "C**3**".

2.2.4 Time Measurement Unit **104**

The time measurement unit **104** measures and outputs a current time.

2.3 Content-Using Device **200**

FIG. **2** illustrates a configuration of the content-using device **200**. The content-using device **200** includes: an online/

offline notification detection unit **201**; a content control unit **202**; and a time measurement unit **203**.

The content-using device **200** is commonly implemented as an embedded device such as a PC and a mobile phone. An embedded device such as a PC and a mobile phone includes a CPU, a memory, a secondary storage device, and a network interface. In the content-using device **200**, when implemented as such an embedded device, the online/offline notification detection unit **201** is implemented as a combination of the network interface, the CPU, and a program that operates on the CPU. Similarly, the content control unit **202** is implemented as a combination of the CPU, the secondary storage device, and a program that operates on the CPU. Further, the time measurement unit **203** is commonly implemented as a combination of hardware such as a timer and software for controlling the hardware. However, as a matter of course, the content-using device **200** pertaining to the present embodiment is not limited to being implemented in such a manner.

2.3.1 Online/Offline Notification Detection Unit **201**

FIG. **10** illustrates a configuration of the online/offline notification detection unit **201**. The online/offline notification detection unit **201** includes: a polling reception unit **210**; a polling Ack transmission unit **211**; an online control transmission unit **213**, and an online/offline control determination unit **212**.

When the content-using device **200** is online, the polling reception unit **210** receives a polling command from the content management server **100**.

Within a predetermined interval from the reception of the polling command, the polling Ack transmission unit **211** generates a polling Ack indicating that the content-using device **200** is online. The polling Ack transmission unit **211** transmits the polling Ack to the content management server **100**. Here, the predetermined interval is, for instance, one-hundred milliseconds. Alternatively, the predetermined interval may be two-hundred milliseconds, three-hundred milliseconds, etc.

The online/offline control determination unit **212** determines whether the content-using device **200** is online or offline. That is, the online/offline control detection determination unit **212** detects a transition of the content-using device **200** from online to offline. Similarly, the online/offline control detection determination unit **212** also detects a transition of the content-using device from offline to online.

For instance, the online/offline control determination unit **212** may perform the determination as described above based on whether or not a polling command is received from the content management server **100**. In specific, the online/offline control determination unit **212** determines that the content-using device **200** is online when a polling command is received from the content management server **100**, while the online/offline control determination unit **212** determines that the content-using device **200** is offline when a polling command is not received from the content management server **100**.

Alternatively, the online/offline control determination unit **212** may determine that the content-using device **200** is online when a communication module in the content-using device **200** is activated. In such a case, the online/offline control determination unit **212** determines that the content-using device **200** is offline when the communication module is deactivated.

Further, when wireless communication is performed with the content management server **100**, the online/offline control determination unit **212** may perform the determination as described in the following. The online/offline control determination unit **212** determines that the content-using device **200** is online when the content-using device **200** is located within a distance from an access point within which radio signals transmitted from the content-using device **200** reach the access point. Further, the online/offline control determination unit **212** determines that the content-using device **200** is offline when the content-using device **200** is not located within a distance from an access point within which radio signals transmitted from the content-using device **200** reach the access point. That is, the online/offline control determination unit **212** determines that the content-using device **200** is offline when radio signals transmitted from the content-using device **200** do not reach an access point.

The online/offline control determination unit **212**, at a time point when a transition from offline to online is detected, notifies the online control transmission unit **213** of a result of the detection. When receiving the detection result from the online/offline control determination unit **212**, the online control transmission unit **213** transmits the detection result, which indicates that the content-using device **200** has transitioned from offline to online, to the content management server **100**.

2.3.2 Content Control Unit **202**

FIG. **11** illustrates a configuration of the content control unit **202**. The content control unit **202** includes: a content management control unit **221**; a management list storage unit **225**; a content usage control unit **223**; a content storage unit **224**; and a content playback unit **226**.

The management list storage unit **225** holds a content management list **222**.

The content storage unit **224** stores a content. The content has been provided from the content management server **100**.

The content management control unit **221** manages the content stored in the content-using device **200** by using the content management list **222**, detailed description of which is provided in the following.

The content usage control unit **223**, by being controlled by the content management control unit **221**, determines whether or not the content-using device **200** has a right to use the content. When the content-using device **200** has the right to use the content, and further, is permitted to use the content, the content usage control unit **223** causes the content playback unit **226** to play back the corresponding content stored in the content storage unit **224**. Further, when the content-using device **200** is offline, the content usage control unit **223** reads out, from the content management list **222**, a content management information piece including a content ID identifying the content. Subsequently, the content usage control unit **223** extracts a scheduled expiration time from the content management information piece read out, and determines whether or not a period of validity as indicated by the scheduled expiration time, has expired. When the period of validity indicated by the scheduled expiration time has already expired, the content usage control unit **223** stops the use of the content. When the period of validity indicated by the scheduled expiration time has not expired, the content usage control unit **223** permits the use of the content.

The content playback unit **226**, by being controlled by the content usage control unit **223**, reads out the content stored in the content storage unit **224** and plays back the content read out.

FIG. **12** is a chart indicating one example of a data configuration of the content management list **222**.

The content management list **222** is provided with areas for storing multiple content management information pieces. Each content management information piece includes either: (i) a combination of one content ID, one relative validity duration, one content management server name, and one scheduled expiration time; or (ii) a combination of one content ID, one relative validity duration, and one content management server name. As such, a content management information piece may include or may not include a scheduled expiration time.

A content ID is identification information identifying a content. A relative validity duration associated with a corresponding content ID indicates a relative period during which use, by the content-using device **200** in offline state, of the content identified by the corresponding content ID is permitted. A content management server name associated with a corresponding content ID identifies a content management server from which the content identified by the corresponding content ID has been transmitted. A scheduled expiration time associated with a corresponding content ID indicates a time point at which validity of use, by the content-using device **200** in offline state, of the content identified by the corresponding content ID expires. A scheduled expiration time is calculated when the content-using device **200** transitions from online to offline by adding a corresponding relative validity duration to the time point at which the content-using device **200** has transitioned from online to offline.

Scheduled Expiration Time=Time Point at which Content-using Device Transitioned from Online to Offline+Relative Validity Period

When the period of validity indicated by the scheduled expiration time has already passed at the point when the content-using device **200** transitions from online to offline, the use, by the content-using device **200** in offline state, of the content identified by the corresponding content ID is prohibited.

For instance, the content management list **222** in FIG. **12** includes a content management information piece **266**, a content management information piece **267**, and a content management information piece **268**.

The content management information piece **266** includes: "Cont**1**" in a content ID field **251**; "24H" in a relative validity duration field **252**; "S**1**" in a content management server name field **253**; and "1/20, 23:30" in an scheduled expiration time field **254**. The content management information piece **266** indicates that the content identified by "Cont**1**" in the content ID field **251** has been supplied from the content management server identified by "S**1**" in the content management server name field **253**. The content-using device **200** is currently offline. "1/20, 23:30", as indicated in the scheduled expiration time field **254**, is set as the time point at which the validity of the content identified by "Cont**1**" in the content ID field **251** expires. Here, the indication of "1/20, 23:30" in the scheduled expiration time field **254** indicates that the period of validity of the content "Cont**1**" expires at 23:30, January 20th. "1/20, 23:30" in the scheduled expiration time field **254** is calculated by adding "24H" in the corresponding relative validity duration field **252** to the time point at which the content-using device **200** has transitioned from online to offline.

The content management information piece **267** includes: "Cont**2**" in a content ID field **255**; "48H" in a relative validity duration field **256**; "S**1**" in a content management server name field **257**; and "1/21, 23:30" in a scheduled expiration time field **258**. The content management information piece **267** indicates that the content identified by "Cont**2**" in the content ID field **255** has been supplied from the content management server identified by "S**1**" in the content management server name field **257**, similar as the content "Cont**1**". Here, the indication of "1/21, 23:30" in the scheduled expiration time field **258** indicates that the period of validity of the content "Cont**2**" expires at 23:30, January 21st. "1/21, 23:30" in the scheduled expiration time field **258** is calculated by adding "48H" in the corresponding relative validity duration field **256** to the time point at which the content-using device **200** has transitioned from online to offline.

The content management information piece **268** includes: "Cont**3**" in a content ID field **259**; "24H" in a relative validity duration field **260**; "S**2**" in a content management server name field **261**; and "1/20, 23:30" in a scheduled expiration time field **262**. The content management information piece **268** indicates that the content identified by "Cont**3**" in the content ID field **259** has been supplied from the content management server identified by "S**2**" in the content management server name field **261**.

FIG. **13** is a chart indicating one example of a data configuration of a content management list **222***a*, which is another example of the content management list **222**. For instance, the content management list **222***a* in FIG. **13** includes a content management information piece **266***a*, a content management information piece **267***a*, and a content management information piece **268***a*. The content management list **222***a* differs from the content management list **222** illustrated in FIG. **12** in that the content management information pieces **266***a*, **267***a*, and **268***a* included therein indicate that the content-using device **200** is currently online.

Each of the content management information pieces **266***a*, **267***a*, and **268***a* does not include a scheduled expiration time. That is, as indicated by the content management information pieces **266***a*, **267***a*, and **268***a*, a scheduled expiration time is not set with respect to each of contents identified by "Cont**1**" in the content ID field **251**, "Cont**2**" in the content ID field **255**, and "Cont**3**" in the content ID field **259**. As such, a specific period of validity is not set with respect to each of such contents, and therefore, the content-using device **200**, which is currently online, is permitted to use such contents for an unlimited period of time.

2.3.3 Time Measurement Unit **203**

The time measurement unit **203** measures and outputs the current time.

2.4 Operations of Content Distribution System **10** (Part 1)

In the following, description is provided on operations of the content distribution system **10**.

(1) Here, description is provided on operations of the content distribution system **10** when the content management server **100** detects whether the content-using device **200** is online or offline, with reference to sequence diagrams illustrated in FIGS. **14** through **16**.

Once the online/offline control determination unit **112** determines that the content-using device **200** is offline ("NO" in Step S**131**), content management server **100** stops performing the detection of whether the content-using device is online or offline (Step S**132**).

When determining that the content-using device **200** is online ("YES" in Step S**131**), the online/offline control determination unit **112** outputs, to the polling transmission unit **110**, an address and an instruction instructing the polling transmission unit **110** to perform polling (Step S**133**). When receiving the address and the polling instruction, the polling transmission unit **110** transmits a polling command to the content-using device **200** (Step S**134**).

The polling reception unit **210** receives the polling command (Step S**134**). The polling reception unit **210** outputs the

polling command received to the online/offline control determination unit **212** (Step S**135**). The polling reception unit **210** also outputs the polling command to the polling Ack transmission unit **211** (Step S**136**). The polling Ack transmission unit **211** generates a polling Ack (Step S**137**), and transmits the polling Ack to the content management server **100** (Step S**138**).

The polling Ack reception unit **111** receives the polling Ack (Step S**138**). When receiving the polling Ack, the polling Ack reception unit **111** outputs the polling Ack to the online/offline control determination unit **112** (Step S**139**).

The online/offline control determination unit **112**, when receiving the polling Ack within a predetermined interval after outputting the polling instruction ("NO" in Step S**140**), determines that the content-using device **200** is online (Step S**141**). That is, the online/offline control determination unit **112** determines that the content-using device **200** is online when no timeout occurs. Here, the predetermined interval is, for instance, one second. Alternatively, the predetermined interval may be five-hundred milliseconds, six-hundred milliseconds, seven-hundred milliseconds, etc.

In contrast, the online/offline control determination unit **112**, when receiving the polling Ack after the predetermined interval has elapsed from the output of the polling instruction or when not receiving a polling Ack ("YES" in Step S**140**), determines that the content-using device **200** is offline (Step S**142**). That is, the online/offline control determination unit **112** determines that the content-using device **200** is offline when timeout occurs.

Subsequently, the online/offline control determination unit **112** outputs, to the device management control unit **120**, a transmission source IP address, a detection time, and a detection result (Step S**143**).

The device management control unit **120** receives, from the online/offline control determination unit **112**, the transmission source IP address, the detection time, and the detection result (Step S**143**).

Subsequently, the device management control unit **120** reads out, from the content-using device list **121**, a content-using device name corresponding to the transmission source IP address received (Step S**144**).

The device management control unit **120** determines whether the detection result indicates online or offline (Step S**145**).

When the detection result indicates online ("Online" in Step S**145**), the device management control unit **120** deletes, from the offline device list **122**, an offline device information piece including the same offline device name as the content-using device name read out from the content-using device list **121** (Step S**146**).

When the detection result indicates offline ("Offline" in Step S**145**), the device management control unit **120** generates an offline device information piece. The offline device information generated includes the content-using device name read out as an offline device name and includes the detection time received as an offline detection time. Subsequently, the device management control unit **120** adds the offline device information piece generated to the offline device list **122** (Step S**147**).

Subsequently, the device management control unit **120** outputs, to the content management control unit **130**, the content-using device name read out, the detection time received, and the detection result received (Step S**148**).

In addition to the above, the device management control unit **120**, when receiving an invalidation instruction for invalidating playback of a content (Step S**149**), reads out, from the content-using device list **121**, an IP address of a connection-destination content-using device (Step S**150**).

When the device management control unit **120** outputs the content-using device name, the detection time, and the detection result, the content management control unit **130** receives the content-using device name, the detection time, and the detection result from the device management control unit **120** (Step S**148**).

In addition to receiving such information from the device management control unit **120**, the content management control unit **130** receives content provision information from the content-using device **200** (Step S**161**). The content provision information includes a content ID and a content-using device name.

When receiving the content provision information, the content management control unit **130** generates a usage device information piece including the content-using device name included in the content provision information. Subsequently, the content management control unit **130** reads out, from the content management list **131**, a management information piece indicated by the content ID included in the content provision information. Subsequently, the content management control unit **130** writes and adds, to the management information read out, the usage device information piece generated (Step S**162**).

As already described above, the content management control unit **130** receives, from the device management control unit **120**, the content-using device name, the detection time, and the detection result (Step S**148**). In addition, the content management control unit **130** receives, from the content-using device **200**, a result of a self-detection performed by the content-using device **200** of whether the content-using device **200** is online or offline (Step S**164**).

The content management control unit **130** determines whether the detection result received indicates online or offline (Step S**165**).

When determining that the detection result received indicates online ("Online" in Step S**165**), the content management control unit **130** tries to read out, from the content management list **131**, a usage device information piece including a content-using device name corresponding to the content-using device **200** (Step S**166**).

When the reading out of the usage device information piece is completed without reading being performed of the entire content management list **131** ("NO" in Step S**167**), the content management control unit **130** deletes an scheduled expiration time included in the usage device information piece (Step S**168**). Following this, the content management control unit **130** returns to Step S**166**.

When the reading out of the usage device information piece is not completed even when reading has been performed of the entire content management list **131** ("YES" in Step S**167**), the content management control unit **130** proceeds to the subsequent step.

On the other hand, when determining that the detection result received indicates offline ("Offline" in Step S**165**), the content management control unit **130** tries to read out, from the content management list **131**, a usage device information piece including a content-using device name corresponding to the content-using device **200** (Step S**169**).

When the reading out of the usage device information piece is completed without reading being performed of the entire content management list **131** ("NO" in Step S**170**), the content management control unit **130** reads out, from the content management list **131**, a relative validity duration corresponding to a content ID. Then, the content management control unit **130** performs the calculation of: scheduled expiration

time=detection time+relative validity duration (Step S172). Subsequently, the content management control unit **130** writes, to the content management list **131**, the scheduled expiration time so calculated in association with the content-using device name corresponding to the content-using device **200** (Step S173). Following this, the content management control unit **130** returns to Step S169.

When the reading out of the usage device information piece is not completed even when reading has been performed of the entire content management list **131** ("YES" in Step S170), the content management control unit **130** proceeds to the subsequent step.

(2) Here, description is provided on operations of the content distribution system **10** when the content-using device **200** receives a content from the content management server **100**, with reference to the sequence diagram illustrated in FIG. **17**.

The content management control unit **221** receives a content from the content management server **100** (Step S301). Subsequently, the content management control unit **221** outputs the content received to the content usage control unit **223** (Step S302).

The content usage control unit **223** receives the content (Step S302), and writes the content received to the content storage unit **224** (Step S303).

The content management control unit **221** receives, from the content management server **100**, a content ID, a relative validity duration, and a content management server name (Step S304). Subsequently, the content management control unit **221** writes a content management information piece to the content management list **222** (Step S305). Here, the content management information piece includes the content ID, the relative validity duration, and the content management server name received.

(3) Here, description is provided on operations of the content-using device **200** in a case where the content-using device **200** performs self-detection of whether the content-using device **200** is online or offline, with reference to the sequence diagrams illustrated in FIGS. **18** and **19**.

The online/offline control determination unit **212** of the content-using device **200** determines whether the content-using device **200** is online or offline (Step S181).

When a result of the detection indicates a transition from offline to online ("Offline to Online" in Step S182), the online/offline control determination unit **212** outputs the detection result to the online control transmission unit **213** (Step S183). The online control transmission unit **213** transmits the detection result to the content management server **100** (Step S184).

On the other hand, when the detection result indicates a transition from online to offline ("Online to Offline" in Step S182), the online/offline control determination unit **212** outputs the detection result and a detection time at which the detection has been made to the content management control unit **221** (Step S185).

The content management control unit **221** receives the detection time and the detection result (Step S185). Subsequently, the content management control unit **221** determines whether the detection result received indicates a transition from online to offline or a transition from offline to online (Step S311).

When the detection result indicates a transition from online to offline ("Online to Offline" in Step S311), the content management control unit **221** tries to read out, from the content management list **222**, a content management information piece (Step S312).

When the reading out of the content management information piece is completed without reading being performed of the entire content management list **222** ("NO" in Step S313), the content management control unit **221** performs the calculation of: scheduled expiration time=detection time+relative validity duration (Step S314). Subsequently, the content management control unit **221** writes, to the content management list **222**, the scheduled expiration time calculated (Step S315). Following this, processing proceeds to Step S312.

When the reading out of the content management information piece is not completed even when reading has been performed of the entire content management list **222** ("YES" in Step S313), the content management control unit **221** proceeds to the subsequent step.

When the detection result indicates a transition from offline to online ("Offline to Online" in Step S311), the content management control unit **221** tries to read out, from the content management list **222**, a content management information piece (Step S316).

When the reading out of the content management information piece is completed without reading being performed of the entire content management list **222** ("NO" in Step S317), the content management control unit **221** deletes a scheduled expiration time in the content management information piece (Step S318). Following this, processing proceeds to Step S316.

When the reading out of the content management information piece is not completed even when reading has been performed of the entire content management list **222** ("YES" in Step S317), the content management control unit **221** proceeds to the subsequent step.

(4) Here, description is provided on operations of the content-using device **200** when the content-using device **200** uses a content, with reference to the sequence diagram illustrated in FIG. **20**.

The content usage control unit **223** receives a content ID corresponding to the content received from the content management server **100** (Step S331). Subsequently, the content usage control unit **223** reads out, from the content management list **222**, a content management information piece including the content ID received (Step S332).

Subsequently, the content usage control unit **223** determines whether or not the content management information piece read out includes a scheduled expiration time (Step S333).

When the content management information piece read out includes a scheduled expiration time ("Included" in Step S333), the content usage control unit **223** determines whether the scheduled expiration time has already passed (Step S334). When the scheduled expiration time has already passed ("YES" in Step S334), the content usage control unit **223** generates an instruction for stopping the use of the content (Step S337). Subsequently, the content usage control unit **223** outputs the instruction for stopping the use of the content to the content playback unit **226** (Step S338).

When the scheduled expiration time has not passed yet ("NO" in Step S334), the content usage control unit **223** generates an instruction for permitting the use of the content (Step S335). Subsequently, the content usage control unit **223** outputs the instruction for permitting the use of the content to the content playback unit **226** (Step S336).

The content usage control unit **223** also determines whether the content-using device **200** has the right to use the content (Step S339). When determining that the content-using device **200** does not have the right to use the content ("Not possessed" in Step S340), the content usage control unit **223** generates an instruction for prohibiting the use of the content (Step S341). Further, the content usage control unit **223** outputs the instruction for prohibiting the use of the

content to the content playback unit **226** (Step S**342**). When determining that the content-using device **200** has the right to use the given content ("Possessed" in Step S**340**), the content usage control unit **223** generates an instruction for permitting the use of the content (Step S**343**). Subsequently, the content usage control unit **223** outputs the instruction for permitting the use of the content to the content playback unit **226** (Step S**344**).

The content playback unit **226** determines whether the instruction received from the content usage control unit **223** is an instruction for permitting the use of the content, an instruction for prohibiting the use of the content, or an instruction for stopping the use of the content (Step S**345**). When an instruction for permitting the use of the content has been received ("Permission" in Step S**345**), the content playback unit **226** plays back the content (Step S**346**). When an instruction for prohibiting or stopping the use of the content has been received ("Prohibition or stop" in Step S**345**), the content playback unit **226** does not play back the content.

2.5 One Example of Configuration of Content Distribution System **10**

FIG. **21** is a diagram illustrating a configuration of a content distribution system **10***a*, which is one example of the content distribution system **10** for providing an explanation of operations of the content distribution system **10**.

In this example, the content distribution system **10***a* includes two content management servers and three content-using devices. More specifically, the content distribution system **10***a* includes: a content management server **100***a* (also referred to as a "content management server S**1**"); a content management server **100***b* (also referred to as a "content management server S**2**"); a content-using device **200***a* (also referred to as a "content-using device C**1**"); a content-using device **200***b* (also referred to as a "content-using device C**2**"); and a content-using device **200***c* (also referred to as a "content-using device C**3**").

FIG. **21** illustrates how contents are shared between the content management servers and the content-using devices. Further, FIG. **21** also illustrates connections between the content management servers and the content-using devices.

The content management server **100***a* provides a content identified by a content name "Cont**1**" and a content identified by a content name "Cont**2**". The content management server **100***b* provides a content identified by a content name "Cont**3**".

The content-using device **200***a* is provided, by the content management server **100***a*, with the contents "Cont**1**" and "Cont**2**". The content-using device **200***a* is also provided, by the content management server **100***b*, with the content "Cont**3**".

The content-using device **200***b* is provided, by the content management server **100***a*, with the content "Cont**1**".

The content-using device **200***c* is provided, by the content management server **100***a*, with the contents "Cont**1**" and "Cont**2**".

As such, the contents "Cont**1**" and "Cont**2**" are shared between the content management server **100***a* and the content-using device **200***a*. That is, the contents "Cont**1**" and "Cont**2**" possessed by the content management server **100***a* are provided for use to the content-using device **200***a*. Similarly, the content "Cont**1**" is shared between the content management server **100***a* and the content-using device **200***b*. That is, the content "Cont**1**" possessed by the content management server **100***a* is provided for use to the content-using device **200***b*. Further, the contents "Cont**1**" and "Cont**2**" are shared between the content management server **100***a* and the content-using device **200***c*. That is, the contents "Cont**1**" and "Cont**2**" possessed by the content management server **100***a* are provided for use to the content-using device **200***c*.

In addition to the above, the content "Cont**3**" is shared between the content management server **100***b* and the content-using device **200***a*. That is, the content "Cont**3**" possessed by the content management server **100***b* is provided for use to the content-using device **200***a*.

Here, the content possessed by the content management server **100***b* is not used by the content-using device **200***b*. That is, as illustrated in FIG. **21**, the content management server **100***b* and the content-using device **200***b* are not connected with each other.

2.6 Operations of Content Distribution System **10** (Part 2)

In the following, description is provided on operations of the content distribution system **10**, with reference to the sequence diagram illustrated in FIG. **22**.

Note that the following description focuses on the interaction between the content management server **100***a* and the content-using device **200***a*, based on the configuration illustrated in FIG. **21**.

FIG. **22** is a diagram illustrating the interaction between the content management server **100***a* and the content-using device **200***a* in a case where the content-using device **200***a* transitions from online to offline during the interaction. Note that the content management server **100***a* transmits a polling command to each of the content-using devices connected therewith at hourly intervals. By performing polling in such a manner, the content management server **100***a* checks whether or not each of the content-using devices is online.

Step 1) At 23:00, January 19th, the content management server **100***a* transmits a polling command to the content-using device **200***a* (Step S**101**). The content-using device **200***a*, which is online at this point, receives the polling command from the content management server **100***a*. Within a predetermined interval from the reception of the polling command, the content-using device **200***a* transmits a polling Ack to the content management server **100***a* (Step S**111**). The content management server **100***a* receives the polling Ack and thereby confirms that the content-using device **200***a* is online (Step S**101**).

At this point, the content-using device list **121** in the content management server **100***a* includes, for each of content-using devices **200***a*, **200***b*, and **200***c* connected with the content management server **100***a*, a content-using device name and an IP address in an associated state, as illustrated in FIG. **5**. On the other hand, no information is registered to the offline device list **122** at this point.

Further, as indicated by the content management list **131***a* illustrated in FIG. **9**, the content "Cont**1**" is being used by the content-using devices **200***a* and **200***b* at this point. Similarly, as indicated by the content management list **131***a* illustrated in FIG. **9**, the content "Cont**2**" is being used by the content-using devices **200***a* and **200***c* at this point. Further, since each of the content-using devices **200***a*, **200***b*, and **200***c* is online at this point, the content management list **131***a* includes an indication of "---" in the corresponding scheduled expiration time field. The indication of "---" in a scheduled expiration time field indicates that a scheduled expiration time is not set. In addition, the content management list **222***a* as illustrated in FIG. **13** indicates the content management list held by the content-using device **200***a* at this point. Since the content-using device **200***a* is online at this point, each of the content management information pieces included in the content management list **222***a* does not include a scheduled expiration time. More specifically, the content management list **222***a* indicates that the content-using device **200***a* is using the contents "Cont**1**" and "Cont**2**" possessed by the content manage-

ment server **100***a* and the content "Cont**3**" possessed by the content management server **100***b*. Further, the content-using device **100***a* is permitted to use each of such contents for an unlimited period of time.

Step 2) At 23:30, January 19th (time point T**01**), the content-using device **200***a* transitions from online to offline. This is due to, for instance, the content-using device **200***a* having moved to a location where radio signals cannot reach or the content-using device **200***a* having deactivated a communication module therein. The content-using device **200***a* self-detects the transition from online to offline, or that is, the online/offline control determination unit **212** detects the transition from online to offline, and notifies the content control unit **202** of the transition from online to offline. The content control unit **202** performs updating of the content management list held by the content-using device **200***a* (Step S**112**). For instance, the content control unit **202** performs the updating such that the content management list **222***a* in FIG. **13**, which corresponds to before the transition from online to offline, is replaced with the content management list **222** in FIG. **12**.

In specific, in the content management list **222** in FIG. **12**, the content management information piece **266** including "Cont**1**" in the content ID field **251** is updated such that "1/20, 23:30", which indicates 23:30, January 20th, is set to the scheduled expiration time field **254**. "1/20, 23:30" is calculated by adding "24H" in the relative validity duration field **252** to 23:30, January 19th, which is the time point at which the content-using device **200***a* transitioned from online to offline. Similarly, in the content management list **222**, the content management information piece **267** including "Cont**2**" in the content ID field **255** is updated such that "1/21, 23:30", which indicates 23:30, January 21st, is set to the scheduled expiration time field **258**. "1/21, 23:30" is calculated by adding "48H" in the relative validity duration field **256** to the time point at which the content-using device **200***a* transitioned from online to offline. In addition, in the content management list **222**, the content management information piece **268** including "Cont**3**" in the content ID field **259** is updated such that "1/20, 23:30" is set to the scheduled expiration time field **262**. "1/20, 23:30" is calculated by adding "24H" in the relative validity duration field **260** to the time point at which the content-using device **200***a* transitioned from online to offline.

The content usage control unit **223** controls the use of the contents "Cont**1**", "Cont**2**", and "Cont**3**" by referring to the scheduled expiration times set in the content management list **222**. For instance, the content usage control unit **223**, while monitoring the current time, controls the use of the content identified by the content ID "Cont**1**" such that the use of the content "Cont**1**" is stopped when the scheduled expiration time "1/20, 23:30" (time point T**02**) is reached. Here, the stopping of the use of a given content refers to either (i) canceling the display of the content or (ii) canceling the display of the content, and further, deleting the content having been expanded on the RAM from the RAM, in response to a timer interrupt notification indicating that the scheduled expiration time has been reached.

In the following, description is provided on other types of control that may be performed when stopping the use of a given content at a point when the corresponding scheduled expiration time being reached. For instance, when a user is viewing the given content at the point when the scheduled expiration time is reached, the user may feel disappointed if the display of the content is suddenly cancelled and disappears. As such, control may be performed such that the use of the content currently under progress is continued and the stopping of the use of the content is performed when a page subsequent to the currently-displayed page is displayed or when an application currently being launched is launched once again. Further, so as to enhance user-friendliness, a notification may be made to the user that a period of validity of the content has expired after the use of the content is actually stopped. Alternatively, the stopping of the use of the content may be performed at the same time as notifying the user of the expiration of the period of validity of the content.

Step 3) At 00:00, January 20th, the content management server **100***a* transmits a polling command to each of the content-using devices connected therewith (Step S**102**). However, a polling Ack is not returned from the content-using device **200***a*, which is offline at this point (Step S**103**). In response to this, the content management server **100***a* registers, to the offline device list **122** (illustrated in FIG. **6**), the device name "C**1**" of the content-using device **200***a* as an offline device name in addition to a detection time ("1/20, 00:00") at which the content-using device **200***a* has been detected as being offline (Step S**104**). Further, the content management control unit **130** of the content management server **100***a* searches the content management list **131** for a device name "C**1**" having been registered to the offline device list **122** as an offline device name. Subsequently, the content management control unit **130** sets, in the content management list **131**, a scheduled expiration time to each content being provided to a content-using device identified by the device name "C**1**". The contents being provided to the content-using device identified by the device name "C**1**" are specified as a result of the above-described search in the content management list **131**. In this example, the content management server **100***a* is providing contents "Cont**1**" and "Cont**2**" to the content-using device identified by the device name "C**1**". More specifically, in the content management list **131**, "1/21, 00:00" is set as the scheduled expiration time of the content "Cont**1**". "1/21, 00:00" is calculated by adding the corresponding relative validity duration to the offline detection time. Similarly, in the content management list **131**, "1/22, 00:00" is set as the scheduled expiration time of the content "Cont**2**". "1/22, 00:00" is calculated by adding "48H", which is the corresponding relative validity duration, to the offline detection time. Here, it should be noted that "1/21, 00:00" set as the scheduled expiration time of the content "Cont**1**" is actually thirty minutes later than the time point "1/20, 23:30", at which the validity of the content "Cont**1**" with respect to the content-using device **200***a* expires. However, at the same time, it should be noted that the content "Cont**1**" is invalidated by the content-using device **200***a* by this time point, if not sooner. That is, "1/21, 00:00" set as the scheduled expiration time of the content "Cont**1**" in the content management list **131** indicates that playback of the content "Cont**1**" cannot be performed at least from this time point onward.

2.6 Operations of Content Distribution System **10** (Part 3)

In the following, description is provided on operations of the content distribution system **10**, with reference to the sequence diagram illustrated in FIG. **23**.

In the operations of the content distribution system **10** illustrated in FIG. **22**, the content-using device **200***a* transitions from online to offline at 23:30, January 19th. FIG. **23** illustrates operations of the content distribution system **10** following this point. More specifically, FIG. **23** illustrates operations of the content distribution system **10** in a case where, after 23:30, January 19th, the content-using device **200***a* becomes online with respect to the content management server **100***a* once again at 03:00, January 20th.

Step 4) At 03:00, January 20th (time point T**03**), the content-using device **200***a* self-detects a transition from offline to

online. At this point, the user of the content-using device **200***a* activates a communication module in the content-using device **200***a* or moves the content-using device **200***a* to a location where radio signals can reach the content-using device **200***a*. Due to this, content-using device **200***a* transitions from offline to online. The content-using device **200***a*, via the online control transmission unit **213**, notifies the content management server **100***a* of the transition from offline to online (Step S**113**). At the same time, the content-using device **200***a*, at time point T**04**, sets an infinity value to each scheduled expiration time in the content management list **222**. When an infinity value is set to a scheduled expiration time, the scheduled expiration time indicates that a specific period of validity is not set with respect to the corresponding content. As such, the content is made available for use whenever desired and for an unlimited period of time. In other words, at time point T**04**, the content-using device **200***a* deletes each scheduled expiration time in the content management list **222**, and thereby makes the corresponding contents usable at any time following time point T**04** while the content-using device **200***a* (Step S**114**).

In the meantime, the content management server **100***a* receives, via the online control reception unit **113**, the notification from the content-using device **200***a* indicating that the content-using device **200***a* is online (Step S**113**). Subsequently, the content management server **100***a* deletes, from the offline device list **122**, an offline device information piece including an offline device name "C**1**". In addition, the content management server **100***a* also deletes, from a management information piece including a content-using device name "C**1**" in the content management list **131**, scheduled expiration times of the contents "Cont**1**" and "Cont**2**". As a result, the content management list **131** is updated so as to indicate that the content-using device **200***a* is online. More specifically, the content management server **100***a* updates the content management list **131** illustrated in FIG. **8** by deleting the scheduled expiration times in the scheduled expiration time fields **137** and **143**. As a result of the updating, the content management list **131***a* illustrated in FIG. **9** is obtained (Step S**105**).

2.7. Effects Achieved by Embodiment 2

In embodiment 2, the content management server performs polling with respect to the content-using device at regular intervals, and thereby performs detection of whether the content-using device is online or offline. Due to this, the content-using device is able to perform control based on a period of validity of a content after actually having transitioned from online to offline. As such, a user is able to use the content with the maximum degree of convenience.

Also, in embodiment 2, the content-using device automatically detects (self-detects) transition from online to offline, and when detecting the transition from online to offline, switches to performing management of a content based on a period of validity of the content. On the other hand, the content-using device, when detecting a transition from offline to online, is able to stop performing management of the content based on the period of validity of the content.

In the meantime, the content management server detects whether the content-using device is online or offline according to whether or not a polling Ack is received from the content-using device as a response to a polling command. Further, the content management server, when the content-using device transitions from offline to online, is able to detect the transition from offline to online by receiving a notification from the content-using device indicating that the content-using device is online. As such, the content management server is able to perform the management of the content in the same way as the management of the content is performed by the content-using device.

As description has been provided above, opportunities are increasing where photos and video contents are exchanged as development of infrastructure supporting such exchange of personal contents progresses. However, at the same time, a user who owns and provides a content to others is concerned that the content he/she has provided may be used in an undesirable or unintended manner at a distribution destination, which includes unauthorized copying or leaking of the content. So as to address such a concern, there is a demand for a structure that enables the user, according to his/her intention, invalidate the content having been provided to a distribution destination and thereby disable the playback of the content at the distribution destination.

In the content distribution system **10**, the management of a content is performed according to a method for controlling the use of the content which is determined according to whether or not the content-using device is connected with the content management server. As such, protection of the content, which has been provided by a provider, is realized while a user utilizing the content is able to use the content with an enhanced degree of convenience. As such, users are able to provide the content to others free of such concerns as described above.

3. Embodiment 3

In the following, description is provided on a content distribution system **20** pertaining to another embodiment of the present invention, with reference to the accompanying drawings.

3.1 Overall Configuration of Content Distribution System **20**

FIG. **24** illustrates an overall configuration of the content distribution system **20**. The content distribution system **20** includes: a content management server **400**; a content-using device **500**; and the communication path **300** between the content management server **400** and the content-using device **500**.

Note that in embodiment 3, constituent elements provided with the same reference signs as in embodiment 2 indicate the same constituent elements as those in embodiment 2.

Further, similar as in embodiment 2, the content distribution system **20** may include two or more content management servers and two or more content-using devices. When multiple content management servers and multiple content-using devices are included in the content distribution system **20**, the content management servers and the content-using devices may be interconnected via a network.

3.2 Configuration of Content Management Server **400**

FIG. **24** also illustrates a configuration of the content management server **400**. The content management server **400** includes: a reception unit **401**; an invalidation instruction transmission unit **402**; an invalidation response reception unit **403**; and a display unit **404**, in addition to the constituent elements included in the content management server **100** pertaining to embodiment 2. Since the constituent elements of the content management server **400**, other than those presented above, are similar to those in embodiment 2, description is provided in the following while focusing on the constituent elements differing between embodiments 2 and 3.

The reception unit **401** receives a user instruction for invalidating the use of a content by a content-using device, or that is, receives an invalidation instruction. In the following,

one example is provided of how the reception unit **401** receives an invalidation instruction.

The display unit **404** displays, for instance, a screen **411** as illustrated in FIG. **25**. The screen **411** has an input field **412** and an input field **413**. The input field **412** is for receiving input of a content-using device name from a user, and the input field **413** is for receiving input of a content ID from the user. The user inputs a content-using device name and a content ID with respect to the input field **412** and the input field **413**, respectively. The reception unit **401** receives, as an invalidation instruction, the content-using device name and the content ID having been input. Subsequently, the reception unit **401** outputs, as the invalidation instruction, the content-using device name and the content ID having been input to the invalidation instruction transmission unit **402**.

FIGS. **26** through **29** each indicate an example of input made with respect to the screen **411** by the user.

FIG. **26**A illustrates a screen **411***a*. In the screen **411***a*, "C**1**" is input to an input field **412***a*, and "*" is input to an input field **413***a*. "C**1**" in the input field **412***a* indicates that the user has specified a content-using device identified by a content-using device name "C**1**". In addition, "*" in the input field **413***a* indicates that the user has specified, as invalidation-target contents, all contents having been provided from the content management server **400** to the content-using device specified in the input field **412***a*. That is, the screen **411***a* indicates that the user has specified the content-using device "C**1**" and has issued an instruction for invalidating all contents in the content-using device "C**1**" that have been provided by the content management server **400**.

FIG. **27** illustrates a screen **411***b*. In the screen **411***b*, "*" is input to an input field **412***b*, and "Cont**1**" is input to an input field **413***b*. "*" in the input field **412***b* indicates that the user has specified all content-using devices, rather than a specific one of the content-using devices. "Cont**1**" in the input field **413***b* indicates that the user has specified, as an invalidation-target content, a content "Cont**1**" provided by the content management server **400**. That is, the screen **411***b* indicates that the user has specified the content identified by the content ID "Cont**1**" and has issued an instruction for invalidating the content identified by "Cont**1**" in each of the content-using devices to which the content "Cont**1**" has been provided.

FIG. **28** illustrates a screen **411***c*. In the screen **411***c*, "C**1**" is input to an input field **412***c*, and "Cont**1**" is input to an input field **413***c*. "C**1**" in the field **412***c* indicates that the user has specified the content-using device "C**1**". In addition, "Cont**1**" in the input field **413***c* indicates that the user has specified, as an invalidation-target content, a content identified by "Cont**1**" having been provided from the content management server **400** to the content-using device specified in the input field **412***c*. That is, the screen **411***c* indicates that the user has issued an instruction for invalidating the content identified by "Cont**1**" in the content-using device "C**1**" to which the content "Cont**1**" has been provided from the content management server **400**.

The device management control unit **120** reads out, from the content-using device list **121**, an IP address corresponding to a content-using device name specified in the invalidation instruction. Subsequently, the invalidation instruction transmission unit **402** transmits the invalidation instruction to the IP address having read out, or that is, to the content-using specified in the invalidation instruction.

For instance, as illustrated in FIG. **26**, when input is received of a content-using device name "C**1**" and a content ID "*", the device management control unit **120** reads out, from the content-using device list **121**, an IP address "192.168.1.21" stored in association with the content-using device name "C**1**". Subsequently, the invalidation instruction transmission unit **402** transmits the invalidation instruction to the IP address "192.168.1.21". In this case, the content-using device "C**1**" at the IP address "192.168.1.21" is instructed to invalidate all contents held thereby (i.e., the contents "Cont**1**" and "Cont**2**").

On the other hand, when input is received of a content-using device name "*" and a content ID "Cont**1**" as illustrated in FIG. **27**, the content management control unit **130** reads out, from the content management list **131**, a management information piece including the content ID "Cont**1**". Subsequently, the content management control unit **130** extracts, from the management information piece read out, all content-using device names included therein. Successively, the device management control unit **120** reads out, from the content-using device list **121**, an IP address stored in association with each content-using device name extracted. The invalidation instruction transmission unit **402** transmits the invalidation instruction to each of the IP addresses read out. In this case, each of the content-using devices corresponding to the IP addresses is instructed to invalidate the content identified by the content ID "Cont**1**". In the example illustrated in FIG. **27**, the content management control unit **130** extracts, from the content management list **131**, content-using device names "C**1**" and "C**2**". Further, the device management control unit **120** reads out, from the content-using device list **121**, the IP addresses "192.168.1.21" and "192.168.1.22". Subsequently, the invalidation instruction is transmitted to each of the IP addresses "192.168.1.21" and "192.168.1.22".

Further, when input is received of a content-using device name "C**1**" and a content ID "Cont**1**" as illustrated in FIG. **28**, the content management control unit **120** reads out, from the content management list **131**, an IP address "192.168.1.21" stored in association with the content-using device name "C**1**". Subsequently, the invalidation instruction transmission unit **402** transmits the invalidation instruction to the IP address "192.168.1.21" read out. In this case, the content-using device corresponding to the IP address "192.168.1.21" is instructed to invalidate the content identified by the content ID "Cont**1**".

Note that upon transmission of the invalidation instruction, the invalidation instruction transmission unit **402** may check whether the content-using device to which the invalidation instruction is to be transmitted is online or offline by using the offline device list **122**. In such a case, the invalidation instruction transmission unit **402** may perform control such that the invalidation instruction is not transmitted to content-using devices that are offline. Alternatively, the invalidation instruction transmission unit **402** may transmit the invalidation instruction to content-using devices that are offline, in addition to those that are online, in a similar manner as described above. By configuring the invalidation instruction transmission unit **402** to transmit the invalidation instruction to a content-using device even when the content-using device is offline, invalidation processing can be performed promptly even when a content-using device registered as being offline in the offline device list **122** has actually transitioned from offline to online immediately before the transmission of the invalidation instruction.

The invalidation response reception unit **403** receives an invalidation response from a content-using device to which the invalidation instruction has been transmitted. When an invalidation response is not returned from a content-using device even though the content management server **400** has recognized the content-using device as being online, the device management control unit **120** registers the content-using device to the offline device list **122**. In specific, as

description has been provided in embodiment 2, the device management control unit **120** registers an offline device information piece corresponding to the content-using device to the offline device list **122**. Further, in such a case, the content management control unit **130** registers, to the content management list **131**, a scheduled expiration time with respect to the content-using device.

In contrast, when an invalidation response is returned from a content-using device that has been recognized by the content management server **400** as being offline, the device management control unit **120** unregisters the content-using device from the offline device list **122**. In specific, the device management control unit **120** deletes an offline device information piece corresponding to the content-using device from the offline device list **122**. Further, in such a case, the content management control unit **130** deletes a scheduled expiration time set with respect to the content-using device from the content management list **131**.

The display unit **404** receives the invalidation response and displays invalidation results. FIGS. **29** through **32** each illustrate an example of a screen displayed by the display unit **404**.

(Screen **441***a*)

A screen **441***a* as illustrated in FIG. **29** is displayed when the invalidation instruction as illustrated in FIG. **26**, which is for invalidating all contents held by the content-using device "C**1**", has been transmitted. The screen **441***a* includes a message **442**. The message **442** indicates that the content-using device "C**1**" is online and (that the contents identified by the respective content names "Cont**1**" and "Cont**2**" have been immediately invalidated.

(Screen **441***b*)

A screen **441***b* as illustrated in FIG. **30** is displayed when the invalidation instruction as illustrated in FIG. **26**, for invalidating all contents held by the content-using device "C**1**", has been transmitted, and further, when the content-using device "C**1**" is offline. The screen **441***b* includes a message **443** indicating that the content-using device "C**1**" is currently offline. In this case, the content management list **131** illustrated in FIG. **8** is referred to, and a scheduled expiration time set with respect to each content being used by the content-using device "C**1**" is read out. That is, the scheduled expiration times corresponding to the contents identified by the content names of "Cont**1**" and "Cont**2**" are read out. As such, the message **443** includes, in association with content names, scheduled expiration times **443***a* read out.

(Screen **441***c*)

A screen **441***c* as illustrated in FIG. **31** is displayed when both of the following conditions (i) and (ii) are satisfied.

(i) As illustrated in FIG. **27**, an invalidation instruction is issued for invalidating the content identified by the content name "Cont**1**" in each content-using device.

(ii) Each content-using device is online.

The screen **441***c* includes a message **444** indicating that the invalidation-target content has been invalidated. In addition, the message **444** includes content-using device names **444***a* indicating the content-using devices that have been using the corresponding content. The content-using device names indicating the content-using devices that have been using the corresponding content are acquired by referring to the content management list **131**.

(Screen **441***d*)

A screen **441***d* as illustrated in FIG. **32** is displayed when both of the following conditions (i) and (ii) are satisfied.

(i) As illustrated in FIG. **27**, an invalidation instruction is issued for invalidating the content identified by the content name "Cont**1**" in each content-using device.

(ii) Only the content-using device "C**1**" is offline and the rest of the content-using devices are online.

The screen **441***d* includes a message **445** indicating that the corresponding content has been invalidated in the content-using devices that are online. In addition, the message **445** also includes a time point **445***b* indicating a time point at which the corresponding content is scheduled to be invalidated in the content-using device that is offline. Further, the message **445** includes content-using device names **445***a* indicating the content-using devices that have been using the corresponding content. The content-using device names of the content-using devices that have been using the corresponding content are acquired by referring to the content management list **131**. Further, the time point at which the corresponding content is scheduled to be invalidated in the content-using device that is offline is acquired by referring to a scheduled expiration time set in the content management list **131** with respect to the content-using device that is offline.

In the above, the display unit **404** receives the invalidation response and displays the invalidation results. However, the present embodiment is not limited to this. That is, a modification may be made as follows.

After having transmitted the invalidation instruction to a content-using device and before receiving the invalidation response from the content-using device, the device management control unit **120** may refer to the offline device list **122**. The device management control unit **120** thus determines whether or not the device name of the content-using device is included in the offline device list **122**. When the device name of the content-using device is not included in the offline device list **122**, the device management control unit **120** determines that the content-using device is online. When the content-using device to which the invalidation instruction has been transmitted is online, the display unit **404** displays a message indicating that invalidation will be immediately performed by the content-using device.

Alternatively, after having transmitted the invalidation instruction to a content-using device and before receiving the invalidation response from the content-using device, the content management control unit **130** may refer to the content management list **131**. The content management control unit **130** thus determines whether or not a scheduled expiration time is set with respect to the content-using device. When a scheduled expiration time is set with respect to the content-using device, the content management control unit **130** determines that the content-using device is offline. When the content-using device to which the invalidation instruction has been transmitted is offline, the display unit **404** displays a scheduled expiration time set with respect to the content-using device.

In addition, (i) when, in response to the invalidation response transmitted to a content-using device, the invalidation response is received from the content-using device or (ii) when, in response to the invalidation response transmitted to a content-using device, an invalidation response is not received within a predetermined interval from the content-using device, and further, such a response to the invalidation instruction having been transmitted contradicts with the state managed by the content management server **400**, the offline device list **122** or the content management list **131** may be updated. In addition, the invalidation results displayed may be updated. The following describes specific examples of the above-described cases of contradiction.

(A) when an Invalidation Response is Received

When the invalidation response is received from a content-using device whose name is included in the offline device list **122** as an offline device name, the reception of the invalida-

tion response contradicts with the corresponding offline device information piece stored in the offline device list **122**.

Further, when the invalidation response is received from a content-using device whose name is included in the content management list **131** as a content-using device name but when a scheduled expiration time is stored in association with the content-using device name, the reception of the invalidation response contradicts with the corresponding management information piece stored in the content management list **131**.

(B) when an Invalidation Response is not Received within a Predetermined Interval

When the invalidation response is not received from a content-using device whose name is not included in the offline device list **122** as an offline device name, the non-reception of the invalidation response contradicts with the corresponding offline device information piece stored in the offline device list **122**.

When the invalidation response is not received from a content-using device whose name is included in the content management list **131** as a content-using device name but when a scheduled expiration time is not stored in association with the content-using device name, the non-reception of the invalidation response contradicts with the corresponding management information piece stored in the content management list **131**.

For instance, when the invalidation response is not returned from a content-using device in a case where the content-using device is recognized by the content management server **400** as being online and display is being performed that the invalidation by the content-using device is to be performed immediately, it can be assumed that the content-using device has transitioned from online to offline at or immediately before the timing at which the determination is made that the invalidation instruction has not been returned thereto. In such a case, the device management control unit **120** registers the content-using device to the offline device list **122** by adding an offline device information piece corresponding to the content-using device. Further, in such a case, the content management control unit **130** performs, in the content management list **131**, setting of a scheduled expiration time and the like with respect to content-using device. In addition, the display unit **404** displays the scheduled expiration time set with respect to the content-using device.

In contrast, when the invalidation response is received from a content-using device in a case where the content-using device is recognized by the content management server **400** as being offline and display is being performed of a period of validity set with respect to the content-using device, it can be assumed that the given content-using device has transitioned from offline to online at or immediately before the timing at which the invalidation response has been returned thereto. In such a case, the device management control unit **120** deletes, from the offline device list **122**, an offline device information piece including the name of the content-using device. Further, in such a case, the content management control unit **130** deletes, from the content management list **131**, a scheduled expiration time corresponding to the content-using device. In addition, the display unit **404** displays a message indicating that the invalidation by the content-using device has been performed immediately.

3.3 Configuration of Content-Using Device **500**

FIG. **24** illustrates a configuration of a content-using device **500**. The content-using device **500** includes: an invalidation instruction reception unit **501**; and an invalidation response transmission unit **502**, in addition to the constituent elements included in the content-using device **200** pertaining to embodiment 2. Since the constituent elements of the content-using device **500**, other than those presented above, are similar to those in embodiment 2, description is provided in the following while focusing on the constituent elements differing between embodiments 2 and 3.

The invalidation instruction reception unit **501** receives an invalidation instruction from the content management server **400** and outputs the invalidation instruction received to the content management control unit **221**.

The content management control unit **221** receives the invalidation instruction from the invalidation instruction reception unit **501**. When receiving the invalidation instruction, the content management control unit **221** extracts a content ID from the invalidation instruction and reads out, from the content management list **222**, a content management information piece including the content ID extracted. Subsequently, the content management control unit **221** invalidates a content identified by the content ID included in the content management information piece read out.

Here, the content management control unit reads out, from the content management list **222**, a content management information piece including the content ID extracted from the invalidation instruction so as to check whether or not a content identified by the content ID included in the invalidation instruction is held by the content-using device **500**.

The content management control unit **221** invalidates the content by deleting the content in the content storage unit **224**. When the invalidation of the content is completed, the content management control unit **221** generates an invalidation response indicating that the invalidation of the content has been completed, and outputs the invalidation response generated to the invalidation response transmission unit **502**.

Here, it should be noted that the invalidation of an invalidation-target content is not limited to being performed in the above-described manner. That is, the invalidation of an invalidation-target content may be performed as described in the following.

When the invalidation-target content is encrypted, the content management control unit **221** may perform the invalidation of the content by deleting a key used for decrypting the content.

Alternatively, the content management control unit **221** may output, to the content usage control unit **223**, the invalidation instruction along with the content ID identifying the invalidation-target content. The content usage control unit **223**, when receiving the invalidation instruction along with the content ID, may prohibit the use of the content identified by the content ID received. The invalidation of an invalidation-target content may be performed in such a manner. In such a case, the content usage control unit **223** may be implemented as a combination of an application program for controlling the use of a content and a processor that operates according to instructions provided from the application program.

Note that, when the use of a content is suddenly stopped by an invalidation instruction pertaining to the content being received while viewing of the content is in progress, the user viewing the content may feel disappointed.

As such, control in such a case may be performed such that the use (viewing) of the content currently under progress is continued and the stopping of the use of the content is performed when a page subsequent to the currently-displayed page in the content is displayed.

For instance, when the invalidation-target content is a musical content (i.e., a song) and an invalidation instruction for invalidating the song is received while the song is being played back, playback may be continued until the end of the

song. Subsequently, following the termination of the playback of the song, the invalidation of the song may be performed.

For instance, when the invalidation-target content is a still image and an invalidation instruction for invalidating the still image is received while the still image is being displayed, the still image may be continuously displayed until the user terminates the display of the still image. Subsequently, when the display of the still image is terminated by a user operation being made, the invalidation of the still image may be performed.

For instance, when the invalidation-target content is a moving image composed of a plurality of scenes and an invalidation instruction for invalidating the moving image is received while the moving image is being played back, playback of the moving image may be continued until the playback of a current scene finishes. Subsequently, when the playback of the current scene is finished and the playback of the moving image is stopped, the invalidation of the moving image may be performed.

In addition, the use of an invalidation-target content may be stopped at a timing when an application program for viewing the content is launched once again after being terminated once. In such a case, after invalidation of the content is performed, a notification may be made to the user indicating that the content has been invalidated so as to ensure user convenience.

The invalidation response transmission unit **502** receives, from the content management control unit **221**, the invalidation response indicating that the invalidation of the content has been completed. When receiving the invalidation response, the invalidation response transmission unit **502** transmits the invalidation response received to the content management server **400**.

3.4 Operations of Content Distribution System **20**

In the following, description is provided on operations of the content distribution system **20**.

(1) Operations of Content Management Server **400**

In the following, description is provided on operations of the content management server **400**, with reference to the sequence diagram illustrated in FIG. **33**.

The display unit **404** displays the screen **411**, which is for receiving an invalidation instruction (Step S**361**). Subsequently, the reception unit **401** receives input of a content-using device name and a content ID (Step S**362**). The reception unit **401** outputs the invalidation instruction, which includes the content-using device name and the content ID, to the invalidation instruction transmission unit **402** (Step S**363**).

Subsequently, the online/offline control determination unit **112** determines whether the content-using device specified is offline (Step S**364**).

When the content-using device specified is online ("NO" in Step S**364**), the device management control unit **120** acquires an IP address corresponding to the content-using device from the content-using device list **121**. The device management control unit **120** outputs the IP address acquired to the invalidation instruction transmission unit **402** (Step S**365**).

The invalidation instruction transmission unit **402** outputs the invalidation instruction received to the IP address received (Step S**367**). As such, the invalidation instruction is transmitted to the content-using device specified.

When the invalidation response reception unit **403** does not receive an invalidation response from the content-using device within a predetermined interval ("YES" in Step S**368**), the device management control unit **120** writes, to the offline device list **122**, an offline device information piece corresponding to the content-using device (Step S**372**). In specific, the offline device information piece includes a content-using device name indicating the content-using device as the offline device name and the current time point as the offline detection time (Step S**372**). In addition, the content management control unit **130** performs the calculation of: scheduled expiration time=detection time+relative validity duration. Subsequently, the content management control unit **130** writes, to the content management list **131**, the scheduled expiration time calculated, in association with the content ID and the content-using device name (Step S**373**).

When the invalidation response reception unit **403** receives an invalidation response from the content-using device within a predetermined interval ("NO" in Step S**368**), the invalidation response reception unit **403** outputs the invalidation response to the display unit **404** (Step S**370**). The display unit **404** displays a screen **411** corresponding to the invalidation response (Step S**371**).

Subsequently, the online/offline control determination unit **112** determines whether the content-using device having transmitted the invalidation response is online (Step S**374**).

When the content-using device is online ("YES" in Step S**374**), the device management control unit **120** deletes, from the offline device list **122**, an offline device information piece including a content-using device name indicating the content-using device as an offline device name (Step S**375**). In addition, the content management control unit **130** deletes, from the content management list **131**, a scheduled expiration time (Step S**376**). Here, the scheduled expiration time corresponds to the content ID and the content-using device name indicating the content-using device.

(2) Operations of Content-Using Device **500**

In the following, description is provided on operations of the content-using device **500**, with reference to the sequence diagram illustrated in FIG. **34**.

The invalidation instruction reception unit **501** receives an invalidation instruction from the content management server **400** (Step S**367**). Subsequently, the content management control unit **221** receives the invalidation instruction from the invalidation instruction reception unit **501** (Step S**382**). The content management control unit **221** searches, in the content management list **222**, for the content ID included in the invalidation instruction (Step S**383**).

The content management control unit **221** invalidates the corresponding content (Step S**384**). Subsequently, the content management control unit **221** outputs an invalidation response to the invalidation response transmission unit **502** (Step S**385**).

Subsequently, the invalidation response transmission unit **502** outputs the invalidation response to the content management server **400** (Step S**369**).

3.5 Example of Invalidation Instruction in Content Distribution System **20**

In the following, description is provided on an example of the invalidation instruction in the content distribution system **20**, with reference to FIGS. **35** through **38**.

FIGS. **35**, **36**, **37**, and **38** respectively illustrate a configuration of content distribution systems **20***a*, **20***b*, **20***c*, and **20***d*, which are examples of the content distribution system **20**. In the examples illustrated in FIGS. **35** through **38**, each of the content distribution systems **20***a*, **20***b*, **20***c*, and **20***d* includes two content management servers and three content-using devices. More specifically, each of the content distribution systems **20***a* through **20***d* includes: a content management server **400***a* (also referred to as a "content management server S**1**"); a content management server **400***b* (also referred to as a "content management server S**2**"); a content-using device

500*a* (also referred to as a "content-using device C1"); a content-using device **500***b* (also referred to as a "content-using device C2"); and a content-using device **500***c* (also referred to as a "content-using device C3").

In each of the content distribution systems **20***a*, **20***b*, **20***c*, and **20***d*, the content management server **400***a* provides a content identified by a content name "Cont1" and a content identified by a content name "Cont2". The content management server **400***b* provides a content identified by a content name "Cont3".

The content-using device **500***a* is provided, by the content management server **400***a*, with the contents "Cont1" and "Cont2". The content-using device **500***a* is also provided, by the content management server **400***b*, with the content "Cont3".

The content-using device **500***b* is provided, by the content management server **400***a*, with the content "Cont1".

The content-using device **500***c* is provided, by the content management server **400***a*, with contents "Cont1" and "Cont2".

(a) A Case where, Among Contents Held by One Content-Using Device that is Online, Each Content Provided from One Content Management Server is Invalidated

FIG. **35** illustrates a case where, among contents held by the content-using device **500***a*, each content provided from the content management server **400***a* is invalidated in accordance with an invalidation instruction from the content management server **400***a*. The reception of the invalidation instruction by the content management server **400***a* is performed as illustrated in FIG. **26**. In addition, in the content distribution system **20***a*, the content-using device **500***a* is online.

The content management server **400***a* acquires, from the content-using device list **121**, an IP address corresponding to the content-using device **500***a*. Subsequently, the content management server **400***a* outputs an invalidation instruction **451** to the IP address acquired. The invalidation instruction **451** is an instruction for instructing the content-using device **500***a* to invalidate, among contents held by the content-using device **500***a*, each content provided from the content management server **400***a*.

When receiving the invalidation instruction **451**, the content-using device **500***a* reads out, from the content management list **222** illustrated in FIG. **12**, a content management information piece including a content management server name "S1". Subsequently, the content-using device **500***a* extracts contents IDs "Cont1" and "Cont2" from the content management information piece read out. As such, the content-using device **500***a* specifies contents identified by the content IDs "Cont1" and "Cont2" as being the invalidation-target contents indicated by the invalidation instruction **451**. Subsequently, the content-using device **500***a* invalidates the contents specified. Following the invalidation of the contents, the content-using device **500***a* returns an invalidation response **452** indicating the invalidation results to the content management server **400***a*.

The content management server **51** receives the invalidation response **452** and displays, for instance, the screen **441***a* illustrated in FIG. **29**.

(b) A Case where, Among Contents Held by One Content-Using Device that is Offline, Each Content Provided from One Content Management Server is Invalidated

FIG. **36** illustrates a case where, among contents held by the content-using device **500***a*, each content provided from the content management server **400***a* is invalidated in accordance with an invalidation instruction from the content management server **400***a*. The reception of the invalidation instruction by the content management server **400***a* is performed as illustrated in FIG. **26**. In addition, in the content distribution system **20***b*, the content-using device **500***a* is offline.

The content management server **400***a* acquires, from the content-using device list **121**, an IP address corresponding to the content-using device **500***a*. Subsequently, the content management server **400***a* outputs an invalidation instruction **453** to the IP address acquired. The invalidation instruction **453** is an instruction for instructing the content-using device **500***a* to invalidate, among contents held by the content-using device **500***a*, each content provided from the content management server **400***a*.

In this case, since the content-using device **500***a* is offline, the content management server **400***a* does not receive a response from the content-using device **500***a* in response to the invalidation instruction **453**. As such, after elapse of a predetermined interval, the content management server **400***a* determines that the content-using device **500***a* is offline. Subsequently, the content management server **400***a* displays, for instance, the screen **441***b* illustrated in FIG. **30** by referring to the content management list **131** illustrated in FIG. **8**.

(c) A Case where One Content Similarly Held by Multiple Content-Using Devices that are Offline is Invalidated

FIG. **37** illustrates a case where a content identified by a content ID "Cont1", which is similarly held by the content-using devices **500***a*, **500***b*, and **500***c*, is invalidated in accordance with an invalidation instruction from the content management server **400***a*. The reception of the invalidation instruction by the content management server **400***a* is performed as illustrated in FIG. **27**. In addition, in the content distribution system **20***c*, each of the content-using devices **500***a*, **500***b*, and **500***c* is online.

In a similar manner as described above, the content management server **400***a* respectively outputs invalidation instructions **454**, **455**, and **456** to the IP addresses corresponding to the content-using devices **500***a*, **500***b*, and **500***c*. Each of the invalidation instructions **454**, **455**, and **456** is an instruction for instructing the corresponding one of the content-using devices **500***a*, **500***b*, and **500***c* to invalidate, among contents held by the corresponding one of the content-using devices **500***a*, **500***b*, and **500***c*, a content identified by the content ID "Cont1".

Each of the content-using devices **500***a*, **500***b*, and **500***c*, when receiving the corresponding one of the invalidation instructions **454**, **455**, and **456**, invalidates the content identified by the content ID "Cont1". Subsequently, the content-using devices **500***a*, **500***b*, and **500***c* respectively return invalidation responses **457**, **458**, and **459**, which indicate the completion of the invalidation, to the content management server **400***a*. The content management server **400***a*, when receiving the invalidation responses **457**, **458**, and **459**, displays, for instance, the screen **441***c* illustrated in FIG. **31**.

(d) A Case where a Content Similarly Held by Multiple Content-Using Devices, Some of which being Online and the Rest being Offline, is Invalidated.

FIG. **38** illustrates a case where a content identified by a content ID "Cont1", which is similarly held by the content-using devices **500***a*, **500***b*, and **500***c*, is invalidated in accordance with an invalidation instruction from the content management server **400***a*. The reception of the invalidation instruction by the content management server **400***a* is performed as illustrated in FIG. **27**. In addition, in the content distribution system **20***d*, the content-using device **500***a* is online, whereas the content-using devices **500***b* and **500***c* are offline.

In a similar manner as described above, the content management server **400***a* respectively outputs invalidation instructions **460**, **461**, and **462** to the IP addresses corresponding to the content-using devices **500***a*, **500***b*, and **500***c*. Each of the invalidation instructions **460**, **461**, and **462** is an instruction for instructing the corresponding one of the content-using devices **500***a*, **500***b*, and **500***c* to invalidate, among contents held by the corresponding one of the content-using devices **500***a*, **500***b*, and **500***c*, a content identified by the content ID "Cont**1**".

In this case, since the content-using device **500***a* is offline, the content management server **400***a* does not receive a response from the content-using device **500***a* in response to the invalidation instruction **460**. As such, after elapse of a predetermined interval, the content management server **400***a* determines that the content-using device **500***a* is offline.

In the meantime, each of the content-using devices **500***b* and **500***c* invalidates the content identified by the content ID "Cont**1**". Subsequently, the content-using devices **500***b* and **500***c* respectively return invalidation responses **463** and **464**, which indicate the completion of the invalidation, to the content management server **400***a*.

Subsequently, since the content-using device **500***a* is offline, the content management server **400***a* refers, for instance, to the content management list **131** illustrated in FIG. **8** and reads out a scheduled expiration time indicating the period of validity of the content identified by the content ID "Cont**1**". Subsequently, the content management server **400***a* displays, for instance, a screen **44***d* as illustrated in FIG. **32**.

Note that playback of the content identified by the content name of "Cont**1**" in the content-using device **500***a* is automatically disabled when the time point indicated by the scheduled expiration time is reached. Further, when the content-using device **500***a* transitions from offline to online before the scheduled expiration time is reached, the content-using device **500***a* makes a notification of the transition from offline to online to the content management server **400***a*. As such, the content management server **400***a* need only issue an invalidation instruction once again with respect to the content-using device **500***a* when such a notification indicating the transition from offline to online is received from the content-using device **500***a*.

3.6. Effects Achieved by Embodiment 3

In embodiment 3, when a corresponding content-using device is online when an invalidation instruction for invalidating a content is received from a user, immediate invalidation of the content is performed by the content-using device. On the other hand, when a corresponding content-using device is offline when an invalidation instruction for invalidating a content is received from a user, the user is notified of when the content will be invalidated in the content-using device.

As such, when a user provides contents to a content-using device corresponding to another user and later invalidates all of the contents he/she has provided to the content-using device corresponding to the other user due to reasons such as a change in the relationship with the other user, the user is able to know when the invalidation of the contents will be completed. As such, the user is able to perform the invalidation of the contents free of concerns.

In addition, when a user desires to invalidate a content which has been distributed to an unidentified number of content-using devices due to he/she having made an operational mistake, the user is able to know the total number of content-using devices to which the content has been distributed. Further, in such a case, the user is able to know in how many of the content-using devices the content will be immediately invalidated online. Further in addition, the user is able to know when a specific content will be invalidated from all existing content-using devices, including offline devices, to which the content has been provided. As such, the user is able to perform the invalidation of contents free of concerns.

4. Embodiment 4

In the following, description is provided on a content distribution system **30** pertaining to embodiment 4 of the present invention, with reference to the accompanying drawings.

The content distribution system **30** differs from the content distribution system **10** in that a content-using device in the content distribution system **30** performs polling at regular intervals with respect to a content management server in the content distribution system **30**. Due to this, the content management server is able to determine only the content-using device performing polling with respect to the content management server as being online while the other content-using devices, which do not perform polling, are determined as being offline.

4.1 Overall Configuration of Content Distribution System **30**

FIG. **39** illustrates an overall configuration of the content distribution system **30**. The content distribution system **30** includes: a content management server **600**; a content-using device **700**; and the communication path **300** between the content management server **600** and the content-using device **700**.

Note that in the content distribution system **30**, constituent elements provided with the same reference signs as in the content distribution system **10** indicate the same constituent elements as those in the content distribution system **10**.

Further, similar as the content distribution system **10**, the content distribution system **30** may include two or more content management servers and two or more content-using devices. Further, when multiple content management servers and multiple content-using devices are included in the content distribution system **20**, the content management servers and the content-using devices may be interconnected via a network.

4.2 Configuration of Content Management Server **600**

FIG. **39** also illustrates a configuration of the content management server **600**. The content management server **600** includes: an online detection unit **601**; a device management unit **602**; and a content management unit **603**.

4.2.1 Configuration of Online Detection Unit **601**

FIG. **40** illustrates a configuration of the online detection unit **601**. The online detection unit **601** includes: a polling reception unit **610**; an online control determination unit **611**; and a polling Ack transmission unit **612**.

(Polling Reception Unit **610**)

The polling reception unit **610** receives a polling command from the content-using device **700**. The polling reception unit **610** outputs information included in the polling command received to the online control determination unit **611**.

(Online Control Determination Unit **611**)

The online control determination unit **611** determines a content-using device that is online according to the information included in the polling command (e.g., an IP address) received from the polling reception unit **610**. Further, the online control determination unit **611** instructs the polling Ack transmission unit **612** to transmit a polling Ack.

The online control determination unit **611** transmits information pertaining to the content-using device having transmitted the polling command, along with the time point at

which the polling command has been received, to the device management unit **602**. Here, the information pertaining to the content-using device is, for instance, an IP address.

(Polling Ack Transmission Unit **612**)

The polling Ack transmission unit **612**, when receiving the instruction for transmitting a polling Ack from the online control determination unit **611**, generates a polling Ack. Subsequently, the polling Ack transmission unit **612** transmits the polling Ack to the content-using device from which the polling command has been transmitted.

4.2.2 Device Management Unit **602**

FIG. **41** illustrates a configuration of the device management unit **602**. The device management unit **602** includes: a device management control unit **620**; and a list storage unit **623**. The list storage unit **623** holds a content-using device list **621** and an online device list **622**.

(Content-Using Device List **621**)

FIG. **42** is a chart indicating one example of a data configuration of the content-using device list **621**. The content-using device list **621** stores, in an associated state, each content-using device receiving a content from the content management server **600** and a corresponding connection destination. Here, the connection destination of a content-using device is, for instance, an IP address.

In specific, the content-using device list **621** is provided with areas for storing multiple content-using device information pieces. Each content-using device information piece includes a content-using device name and an IP address. A content-using device name is a name identifying a content-using device, and an IP address indicates a location on an IP network at which the content-using device is located.

(Online Device List **622**)

FIG. **43** is a chart indicating one example of a data configuration of the online device list **622**. The online device list **622** is provided with areas for storing multiple online device information pieces. Each online device information piece includes an online device name and a final access time. An online device name is a name identifying a content-using device determined as being online. A final access time indicates a time point at which the content-using device most recently accessed the content management server **600**. More specifically, a final access time includes indication of the month, the day, and the time corresponding to the last time the content-using device accessed the content management server **600**.

The online device list **622** includes, for instance, an online device information piece including "C**1**" in an online device name field **624** and "1/21, 23:00" in a final access time field **625**. This online device information piece indicates that the content management server **600** most recently received a polling command from the content-using device indicated by "C**1**" in the online device name field **624** at 23:00, January 21st as indicated in the final access time field **625**. The storing of the final access time and the content-using device name as the online device name in the online device list **622** was performed at 23:00, January 21st. The indication in the final access time field **625** indicates the time point at which the content-using device "C**1**" most recently accessed the content management server **600**. In other words, according to the online device list **622**, the content-using device "C**1**" has not accessed the content management server **600** since 23:00, January 21st.

(Device Management Control Unit **620**)

The device management control unit **620** controls the writing, the reading out, and the updating of content-using device information with respect to the content-using device list **621**. The device management control unit **620** also controls the writing, the reading out, and the updating of online device information with respect to the online device list **622**. The device management control unit **620** receives, from the online detection unit **601**, information pertaining to a content-using device (e.g., an IP address of the content-using device), and reads out, from the content-using device list **621**, a corresponding content-using device name.

In addition, the device management control unit **620**, when updating the online device list **622**, transmits an updated online device name and an updated final access time to the content management unit **603**.

4.2.3 Content Management Unit **603**

FIG. **44** illustrates a configuration of the content management unit **603**. The content management unit **603** includes: a content management control unit **630**; and a list storage unit **632**. The list storage unit **632** holds a content management list **631**.

(Content Management List **631**)

FIG. **45** is a chart indicating one example of a data configuration of the content management list **631**.

The content management list **631** is provided with areas for storing multiple management information pieces. Each management information piece includes: one content ID; one validity duration; and zero, one, or multiple usage device information pieces. That is, a management information piece includes either (i) a combination of one content ID and one validity duration or (ii) a combination of one content ID, one validity duration, and one or more usage device information pieces. A management information piece including a combination of one content ID and one validity duration indicates an initial state. When a management information piece is in the initial state, one or more usage device information pieces may be added thereto. Further, when a management information piece includes one or more usage device information pieces, one or more usage device information pieces may further be added to the management information piece.

A content ID is identification information uniquely identifying a content. A validity duration is in correspondence with a content ID and indicates a time period (a duration) from the point at which the content identified by the content ID is distributed, during which the use of the content by content-using devices is permitted. A content-using device name identifies a content-using device. The content-using device identified by the content-using device name uses the content identified by the corresponding content ID. A scheduled expiration time is calculated from the point at which the corresponding content has been distributed to the corresponding content-using device and indicates a time point at which the period of validity of use of the content by the content-using device expires.

(Content Management Control Unit **630**)

The content management control unit **630** controls the writing, the reading out, and the updating of management information with respect to the content management list **631**.

In specific, when a content is provided to a content-using device, the content management control unit **630** receives a content ID identifying the content, a content-using device name identifying the content-using device, and a distribution time at which the content has been distributed to the content-using device. Subsequently, the content management control unit **630** uses the content ID identifying the distributed content and thereby reads out, from the content management list **631**, a management information piece including the content ID. Subsequently, the content management control unit **630** extracts a validity duration from the management information piece read out. Subsequently, the content management con-

trol unit **630** sets a scheduled expiration time by adding the validity duration to the distribution time.

Scheduled Expiration Time=Distribution Time+Validity Duration

Subsequently, the content management control unit **630** writes and thereby adds a usage device information piece including the content-using device name and the scheduled expiration time to the management information piece read out from the content management list **631**.

In addition, when receiving a content-using device name and a final access time from the device management control unit **620**, the content management control unit **630** updates the scheduled expiration time set with respect to the content-using device identified by the content-using device name received by adding the validity duration to the final access time.

More specifically, the content management control unit **630** reads out, from the content management list **631**, a management information piece including a content-using device name of a content-using device that is online. Subsequently, the content management control unit **630** extracts a validity duration from the management information piece read out, and extracts a usage device information piece including the content-using device name from the management information piece read out. Subsequently, the content management control unit **630** adds the validity duration extracted to the final access time received and sets the time obtained as a result of the addition as the scheduled expiration time.

Scheduled Expiration Time=Final Access Time+Validity Duration

Subsequently, the content management control unit **630** overwrites the scheduled expiration time included in the usage device information piece having been extracted by using the scheduled expiration time obtained as a result of the calculation. Subsequently, the content management control unit **630** writes back the usage device information piece including an overwritten scheduled expiration time to the content management list **631**.

(Content Management List **631**)

The content management list **631** includes a management information piece **639** as illustrated in FIG. **45**. The management information piece **639** includes: "Cont**1**" in a content ID field **633**; "24H" in a validity duration field **634**; "C**1**" in a content-using device name field **635**; "1/21, 00:00" in a scheduled expiration time field **636**; "C**2**" in a content-using device name field **637**; and "1/21, 00:00" in a scheduled expiration time field **638**.

The management information piece **639** indicates, for instance, that the content identified by "Cont**1**" in the content ID field **633** has been distributed at 00:00, January 20th to the content-using devices identified by "C**1**" in the content-using device name field **635** and "C**2**" in the content-using device name field **637**. Further, the management information piece **639** indicates that "24H" is the validity duration of the content identified by "Cont**1**" in the content ID field **633**. As such, the scheduled expiration time of the content "Cont**1**" with respect to each of the content-using devices identified by "C**1**" in the content-using device name field **635** and "C**2**" in the content-using device name field **637** is calculated as "1/21, 00:00" as indicated in the scheduled expiration time fields **636** and **638**, which is later by "24H" in the validity duration field **634** than the distribution time "1/20, 00:00".

(Content Management List **631***a*)

FIG. **46** is a chart indicating one example of a data configuration of a content management list **631***a*, which is another example of the content management list **631**.

The content management list **631***a* includes a management information piece **639***a* and a management information piece **646***a* as illustrated in FIG. **46**. The management information piece **639***a* includes: "Cont**1**" in the content ID field **633**; "24H" in the validity duration field **634**; "C**1**" in the content-using device name field **635**; "1/21, 23:00" in a scheduled expiration time field **636***a*; "C**2**" in the content-using device name field **637**; and "1/21, 00:00" in the scheduled expiration time field **638**. The management information piece **646***a* includes: "Cont**2**" in a content ID field **640**; "48H" in a validity duration field **641**; "C**1**" in a content-using device name field **642**; "1/22, 23:00" in a scheduled expiration time field **643***a*; "C**3**" in a content-using device name field **644**; and "1/22, 00:00" in a scheduled expiration time field **645**.

For instance, when an online device name "C**1**" and a final access time "1/20, 23:00" are received from the device management control unit **620**, first, the management information piece **639** including the device name "C**1**" as the content-using device name is read out from the content management list **631**, and then, extraction is performed of "24H" in the validity duration field **634** in the management information piece **639** and the usage device information piece including the device name "C**1**" as the content-using device name. Subsequently, the time point "1/21, 23:00" is calculated by adding "24H" in the validity duration field **634** extracted to the final access time "1/20, 23:00". Subsequently, overwriting is performed of "1/21, 00:00" in the scheduled expiration time field **636** in the usage device information piece extracted by setting the time point "1/21, 23:00" obtained as a result of the calculation as the scheduled expiration time. Subsequently, the usage device information piece including the overwritten scheduled expiration time of "1/21, 23:00" is written back to the management information piece **639** in the content management list **631**. As such, the management information piece **639***a* includes "1/21, 23:00" in the scheduled expiration time field **636***a* as in the content management list **631***a* illustrated in FIG. **46**.

In addition, similar as in the above, the management information piece **646** including the device name "C**1**" as the content-using device name is read out from the content management list **631**. Then, extraction is performed of "48H" in the validity duration field **641** in the management information piece **646** and the usage device information piece including the device name "C**1**" as the content-using device name. Subsequently, the time point "1/22, 23:00" is calculated by adding "48H" in the validity duration field **641** extracted to the final access time "1/20, 23:00". Subsequently, overwriting is performed of "1/22, 00:00" in the scheduled expiration time field **643** in the usage device information piece extracted by setting the time point "1/22, 23:00" obtained as a result of the calculation as the scheduled expiration time. Subsequently, the usage device information piece including the overwritten scheduled expiration time of "1/22, 23:00" is written back to the management information piece **646** in the content management list **631**. As such, the management information piece **646***a* includes "1/22, 23:00" in the scheduled expiration time field **643***a* as in the content management list **631***a* illustrated in FIG. **46**.

The updating of the content management list **631** illustrated in FIG. **45** is performed in such a manner as described above, whereby the content management list **631***a* illustrated in FIG. **46** is obtained. Compared with the content management list **631**, the content management list **631***a* includes updated scheduled expiration times in the scheduled expiration time fields **636***a* and **643***a*.

4.3 Content-Using Device **700**

FIG. **39** illustrates a configuration of the content-using device **700**. The content-using device **700** includes: an online notification unit **701**; a content control unit **702**; and a time measurement unit **703**.

4.3.1 Online Notification Unit **701**

FIG. **47** illustrates a configuration of the online notification unit **701**. The online notification unit **701** includes: a polling transmission unit **710**; an online control determination unit **711**; and a polling Ack reception unit **712**.

(Polling Transmission Unit **710**)

The polling transmission unit **701** receives a polling transmission instruction and information pertaining to an address to which a polling command is to be transmitted from the online control determination unit **711**. When receiving the polling transmission instruction and the information pertaining to the address, the polling transmission unit **701** transmits a polling command to the content management server **600**. Following the transmission of the polling command, the polling transmission unit **701** transmits information pertaining to the transmission destination and a transmission time at which the polling command has been transmitted to the polling Ack reception unit **712**.

(Online Control Determination Unit **711**)

The online control determination unit **711** determines whether the content-using device **700** is online or offline. For instance, the online control determination unit **711** determines whether the content-using device **700** is online or offline by determining whether or not a polling Ack is received from the content management server **600** in response to a polling command having been transmitted. That is, the online control determination unit **711** determines that the content-using device **700** is online when a polling Ack is received from the content management server **600**. On the other hand, the online control determination unit **711** determines that the content-using device **700** is offline when a polling Ack is not received from the content management server **600**.

Alternatively, the online control determination unit **711** may determine whether the content-using device **700** is online or offline by determining whether or not a communication module in the content-using device **700** is activated or not.

Alternatively, when the content-using device **700** performs wireless communication, the online control determination unit **711** may determine whether or not the content-using device **700** is online or offline by determining whether or not the content-using device **700** is located within a distance from an access point within which radio signals transmitted from the content-using device **700** reach the access point.

In addition, the online control determination **711** may determine that the content-using device **700** is not online when a transmission error is received from a router when performing polling.

When determining that the content-using device **700** is online, the online control determination unit **711** transmits, to the polling transmission unit **710**, the polling transmission instruction along with the information pertaining to the address of the content management server **600**. In addition, the content-using device **700**, when receiving a notification of a scheduled expiration time of a content from the content control unit **702**, outputs a polling transmission instruction to the polling transmission unit **710** before the scheduled expiration time is reached. The online control determination unit **711** receives, from the polling Ack reception unit **712**, a polling Ack transmitted from the content management server **600**. Subsequently, the online control determination unit **711** outputs, to the content control unit **702**, a content management server name and a transmission time indicating the time point at which the polling has been performed.

(Polling Ack Reception Unit **712**)

The polling Ack reception unit **712** receives a polling Ack from the content management server **600**. By receiving the polling Ack from the content management server **600**, the polling Ack reception unit **712** determines that a notification has been made to the content management server **600** that the content-using device **700** is online. Subsequently, the polling Ack reception unit **712** notifies the online control determination unit **711** that a notification has been made to the content management server **600** that the content-using device **700** is online.

4.3.2 Content Control Unit **702**

FIG. **48** illustrates a configuration of the content control unit **702**. The content control unit **702** includes: a content management control unit **721**; a list storage unit **724**; a content storage unit **723**; and a content playback unit **725**. The list storage unit **724** holds a content management list **722**.

(Content Management Control Unit **721**)

The content management control unit **721** manages a content stored in the content-using device **700** by using the content management list **722**, detailed description of which is provided in the following. The content management control unit **721** refers to a scheduled expiration time included in the content management list **722**, and when the scheduled expiration time indicates that the use of a corresponding content is permitted, controls the content playback unit **725** such that the use of the corresponding content stored in the content storage unit **723** is enabled. In contrast, when the scheduled expiration time included in the content management list **722** has already passed, the content management control unit **721** controls the content playback unit **725** so as to stop the use of the corresponding content stored in the content storage unit **723**. In addition, when referring to a scheduled expiration time included in the content management list **722**, the content management control unit **721** makes a notification to the online control determination unit **711**. In addition, when receiving the content management server name and the polling transmission time from the online control determination unit **711**, the content management control unit **721** updates a scheduled expiration time included in the content management list **722** as described in the following.

(Content Management List **722**)

The content management list **722** is a list for managing contents received from the content management server **600**. FIG. **49** is a chart indicating one example of a data configuration of the content management list **722**. The content management list **722** is provided with areas for storing multiple management information pieces. Each management information piece includes a content ID, a validity duration, a content management server name, and a scheduled expiration time. A content ID is identification information uniquely identifying a content. A validity duration is in correspondence with a content ID and indicates a duration during which the use of the content by content-using devices is permitted. A content management server name is a name identifying a content management server that has transmitted the corresponding content. A scheduled expiration indicates a time point at which a period of validity, during which the content-using device **700** is permitted to use the content, expires.

The content management list **722** includes, for instance, a management information piece **731**, a management information piece **732**, and a management information piece **733**, as illustrated in FIG. **49**.

The management information piece **731** includes: "Cont**1**" in a content ID field **734**; "24H" in a validity duration field **735**; "S**1**" in a content management server name field **736**; and "1/21, 00:00" in a scheduled expiration time field **737**.

The management information piece **731** indicates a situation as follows. The content identified by "Cont**1**" in the content ID field **734** has been supplied from the content management server identified by "S**1**" in the content management server name field **736**. Further, the period during which the content-using device **700** is permitted to use the content "Cont**1**" is "24H" as indicated in the validity duration field **735**. In addition, the period during which the content-using device **700** is permitted to use the content "Cont**1**" ends at "1/21, 00:00" as indicated in the scheduled expiration time field **737**. Here, "1/21, 00:00" in the scheduled expiration time field **737** is calculated by adding "24H" in the validity duration field **733** to a time point at which the content "Cont**1**" has been received from the content management server "S**1**".

The management information piece **732** includes: "Cont**2**" in a content ID field **738**; "48H" in a validity duration field **739**; "S**1**" in a content management server name field **740**; and "1/22, 00:00" in a scheduled expiration time field **741**. The management information piece **732** indicates a situation as follows. The content identified by "Cont**2**" in the content ID field **738** has been supplied from the content management server identified by "S**1**" in the content management server name field **740**. Further, the period during which the content-using device **700** is permitted to use the content "Cont**2**" is "48H" as indicated in the validity duration field **739**. In addition, the period during which the content-using device **700** is permitted to use the content "Cont**2**" ends at "1/22, 00:00" as indicated in the scheduled expiration time field **741**. Here, "1/22, 00:00" in the scheduled expiration time field **741** is calculated by adding "48H" in the validity duration field **739** to a time point at which the content "Cont**2**" has been received from the content management server "S**1**".

The management information piece **733** includes: "Cont**3**" in a content ID field **742**; "24H" in a validity duration field **743**; "S**2**" in a content management server name field **744**; and "1/21, 23:30" in a scheduled expiration time field **745**. Since the situation indicated by the management information piece **733** is obvious when referring to the above, description thereon is omitted herein.

(Content Management List **722***a*)

FIG. **50** is a chart indicating one example of a data configuration of a content management list **722***a*, which is another example of the content management list **722**. The content management control unit **721**, when receiving a content management server name and a polling transmission time from the online control determination unit **711**, updates a scheduled expiration time in the content management list **722**.

For instance, in the example of the case indicated by the content management list **722***a* illustrated in FIG. **50**, the content management control unit **721** has received a content management server name "S**1**" and a polling transmission time "1/20, 23:00" from the online control determination unit **711**. In such a case, the content management control unit **721** updates a scheduled expiration time for each content corresponding to the content management server "S**1**" such that each scheduled expiration time indicates a time point calculated by adding the corresponding validity duration to the polling transmission time "1/20, 23:00". For instance, when taking as an example the content "Cont**1**", updating of the scheduled expiration time is performed such that the updated scheduled expiration time indicates "1/21, 23:00", which is calculated by adding the corresponding validity duration of "24H" to the polling transmission time "1/20, 23:00". Further, when taking as an example the content "Cont**2**", updating of the scheduled expiration time is performed such that the updated scheduled expiration time indicates "1/22, 23:00", which is calculated by adding the corresponding validity duration of "48H" to the polling transmission time "1/20, 23:00". As a result, the content management list **722***a* illustrated in FIG. **50** includes "1/21, 23:00" in a scheduled expiration time field **737***a* instead of "1/21, 00:00" in the scheduled expiration time **737** included in the content management list **722**, and includes "1/22, 23:00" in a scheduled expiration time field **741***a* instead of "1/22, 00:00" in the scheduled expiration time field **741** included in the content management list **722**.

4.4 Operations of Content Distribution System **30** (Part 1)

In the following, description is provided on operations of the content distribution system **30**.

(1) Operations of Content Management Server **600** when a Contents is Provided to a Content-Using Device

In the following, description is provided on operations involved in the updating of the content management list **631** by the content management control unit **630** when a content is provided from the content management server **600** to a content-using device, with reference to the flowchart illustrated in FIG. **51**.

When a content is provided to a content-using device, the content management control unit **630** receives a content ID identifying the content, a content-using device name identifying the content-using device, and a distribution time at which the content has been distributed (Step S**501**).

Subsequently, the content management control unit **630**, reads out, from the content management list **631**, a management information piece including the content ID and the content-using device name received (Step S**502**). Subsequently, the content management control unit **630** extracts a validity duration from the management information piece read out (Step S**503**). Subsequently, the content management control unit **630** adds the validity duration read out to the distribution time received, and sets the time point obtained as a result of the calculation as a scheduled expiration time (Step S**504**). Subsequently, the content management control unit **630** generates a usage device information piece including the content-using device name and the scheduled expiration time. Further, the content management control unit **630** writes, to the content management list **631**, the usage device information piece so generated in association with the content ID and the validity duration (Step S**505**).

(2) Operations of Content Management Server **600** when Receiving a Polling Command

In the following, description is provided on operations of the content management server **600** when receiving a polling command from the content-using device **700**, with reference to the sequence diagram illustrated in FIG. **52**.

The polling reception unit **610** receives a polling command including an IP address from the content-using device **700** (Step S**511**). Subsequently, the polling reception unit **611** outputs the polling command received to the online control determination unit **611** (Step S**512**).

The online control determination unit **611** determines a content-using device that is online by using the IP address included in the polling command (Step S**513**). The online control determination unit **611** also outputs an instruction for generating a polling Ack to the polling Ack transmission unit **612** (Step S**514**).

The polling Ack transmission unit **612** generates a polling Ack (Step S**515**), and transmits the polling Ack generated to

the content-using device **700**, from which the polling command has been received (Step S**516**).

Subsequently, the online control determination unit **611** outputs, to the device management control unit **620**, a reception time at which the polling command has been received and the IP address included in the polling command (Step S**517**).

The device management control unit **620** acquires, by using the content-using device list **621**, a content-using device name corresponding to the IP address (Step S**518**). Subsequently, the device management control unit **620** reads out, from the online device list **622**, an online device information piece including the content-using device name acquired. Subsequently, the device management control unit **620** overwrites a final access time included in the online device information piece read out with the reception time, and writes back, to the online device list **622**, the online device information piece including the overwritten final access time (Step S**519**). Then, the device management control unit **620** transmits the online device name and the final access time to the content management control unit **630** (Step S**520**).

The content management control unit **630**, reads out, from the content management list **631**, a management information piece including the device name received as a content-using device name (Step S**521**). Subsequently, the content management control unit **630** extracts a validity duration from the management information piece read out (Step S**522**). Subsequently, the content management control unit **630** performs the calculation of: scheduled expiration time=final access time+validity duration (Step S**523**). Subsequently, the content management control unit **630** overwrites the scheduled expiration time corresponding to the content-using device name in the management information piece read out with the scheduled expiration time so calculated. Subsequently, the content management control unit **630** writes back, to the content management list **631**, the management information piece including the overwritten scheduled expiration time (Step S**524**).

(3) Operations of Content-Using Device **700** when Outputting a Polling Command

In the following, description is provided on operations of the content-using device **700** when outputting a polling command, with reference to the sequence diagrams illustrated in FIGS. **53** and **54**.

The online control determination unit **711** determines whether the content-using device **700** is online (Step S**531**). When the content-using device is online ("YES" in Step S**532**), the online control determination unit **711** outputs a polling transmission instruction and an address to which a polling command is to be transmitted to the polling transmission unit **710** (Step S**533**). The online control determination unit **711** also outputs a polling transmission time and the address to the content management control unit **721** (Step S**534**).

The polling transmission unit **710** generates a polling command and outputs the polling command to the address received (Step S**511**).

The content management control unit **721** tries to read out, from the content management list **722**, a management information piece including the address (i.e., a specific content management server name) (Step S**535**). When the reading out of the management information piece is completed without reading being performed of the entire content management list **722** ("NO" in Step S**536**), the content management control unit **721** extracts a validity duration from the management information piece read out (Step S**537**). Subsequently, the content management control unit **721** performs the calculation of: scheduled expiration time=polling transmission time+validity duration (Step S**538**). Subsequently, the content management control unit **721** overwrites the scheduled expiration time included in the management information piece read out with the scheduled expiration time so calculated. Subsequently, the content management control unit **721** writes back, to the content management list **722**, the management information piece including the overwritten scheduled expiration time (Step S**539**). Then, the content management control unit **721** returns to Step S**535** and performs processing once again from Step S**535**.

The polling Ack reception unit **712** receives a polling Ack from the content management server **600** (Step S**516**). When receiving the polling Ack, the polling Ack reception unit **712** outputs the polling Ack received to the online control determination unit **711** (Step S**551**).

When the reading out of the management information piece is not completed even when reading has been performed of the entire content management list **722** ("YES" in Step S**536**), the content management control unit **721** tries to read out, from the content management list **722**, a management information piece including the address (i.e., a specific content management server name) (Step S**561**). When the reading out of the management information piece is completed without reading being performed of the entire content management list **722** ("NO" in Step S**562**), the content management control unit **721** extracts a scheduled expiration time from the management information piece read out (Step S**563**). Subsequently, the content management control unit **721** outputs the scheduled expiration time extracted to the online control determination unit **711** (Step S**564**).

The online control determination unit **711** determines whether the current time point precedes the scheduled expiration time (Step S**565**). When the current time point does not precede the scheduled expiration time ("NO" in Step S**564**), the online control determination unit **711** returns to Step S**562** and performs processing once again from Step S**562**. When the current time point precedes the scheduled expiration time ("YES" in Step S**564**), the online control determination unit **711** proceeds to the processing following Step S**532**.

(4) Operations of Content-Using Device **700** when Determining Control of a Content being Used

In the following, description is provided on operations of the content-using device **700** when determining control of a content being used, with reference to the sequence diagram illustrated in FIG. **55**.

The content management control unit **721** reads out, from the content management list **722**, a management information piece pertaining to a content being used (Step S**571**). Subsequently, the content management control unit **721** extracts a scheduled expiration time from the management information piece read out (Step S**572**). Subsequently, the content management control unit **721** determines whether the current time point succeeds the scheduled expiration time (Step S**573**). When the current time point succeeds the scheduled expiration time ("Has passed" in Step S**573**), the content management control unit **721** stops the use of the content (Step S**575**). When the current time point does not succeed the scheduled expiration time ("Has not passed" in Step S**573**), the content management control unit **721** permits the use of the content (Step S**574**).

4.5 Configuration of Content Distribution System **30**

FIG. **56** is a diagram illustrating a configuration of a content distribution system **30***a*, which is one example of the content distribution system **30**. In the example illustrated in FIG. **56**, the content distribution system **30***a* includes two content management servers and three content-using devices.

More specifically, the content distribution system **30***a* includes: a content management server **600***a* (also referred to as a "content distribution server S**1**"); a content management server **600***b* (also referred to as a "content distribution server S**2**"); a content-using device **700***a* (also referred to as a "content-using device C**1**"); a content-using device **700***b* (also referred to as a "content-using device C**2**"); and a content-using device **700***c* (also referred to as a "content-using device C**3**").

FIG. **56** illustrates how contents are shared between the content management servers and the content-using devices. Further, FIG. **56** also illustrates connections between the content management servers and the content-using devices.

The content management server **600***a* provides a content identified by a content name "Cont**1**" and a content identified by a content name "Cont**2**". In addition, the content management server **600***b* provides a content identified by a content name "Cont**3**".

The content-using device **700***a* is provided, by the content management server **600***a*, with the contents "Cont**1**" and "Cont**2**". The content-using device **700***a* is also provided, by the content management server **600***b*, with the content "Cont**3**".

The content-using device **700***b* is provided, by the content management server **600***a*, with the content "Cont**1**".

The content-using device **700***c* is provided, by the content management server **600***a*, with the contents "Cont**1**" and "Cont**2**".

As such, the contents "Cont**1**" and "Cont**2**" are shared between the content management server **600***a* and the content-using device **700***a*. That is, the contents "Cont**1**" and "Cont**2**" possessed by the content management server **600***a* are provided for use to the content-using device **700***a*.

Similarly, the content "Cont**1**" is shared between the content management server **600***a* and the content-using device **700***b*. That is, the content "Cont**1**" possessed by the content management server **600***a* is provided for use to the content-using device **700***b*.

Further, the contents "Cont**1**" and "Cont**2**" are shared between the content management server **600***a* and the content-using device **700***c*. That is, the contents "Cont**1**" and "Cont**2**" possessed by the content management server **600***a* are provided for use to the content-using device **700***c*.

In addition to the above, the content "Cont**3**" is shared between the content management server **600***b* and the content-using device **700***a*. That is, the content "Cont**3**" possessed by the content management server **600***b* is provided for use to the content-using device **700***a*.

Here, the content possessed by the content management server **600***b* is not used by the content-using device **700***b*. That is, as illustrated in FIG. **56**, the content management server **600***b* and the content-using device **700***b* are not connected with each other. The same applies to the content management server **600***b* and the content-using device **700***c*.

4.6 Operations of Content Distribution System **30** (Part 2)

Note that in the following, based on the configuration illustrated in FIG. **56**, description is provided on the interaction between the content management server **600***a* and the content-using device **700***a*, with reference to FIGS. **57** and **58**.

Step 11) At 00:00, January 20th, the content management server **600***a* transmits, to the content-using device **700***a*, the contents identified by the respective content IDs "Cont**1**" and "Cont**2**" in response to a request made from the content-using device **700***a*. In addition, the content management server S**1** stores a usage device information piece corresponding to the content-using device **700***a* to the content management list **631** (Step S**201**). The content management list **631** at this point is as illustrated in FIG. **45**. Subsequently, at time point T**11**, the content-using device **700***a* receives the contents "Cont**1**" and "Cont**2**" and stores management information pieces corresponding to the contents to the content management list **722** (Step S**211**). The content management list **722** at time point T**11** is as illustrated in FIG. **49**. Here, for instance, the validity duration of the content "Cont**1**" is "24H", and hence, the scheduled expiration time for the content "Cont**1**" is time point T**14**, which is calculated by adding "24H" to time point T**11**. In other words, the content "Cont**1**" is available for use from time point T**11** to time point T**14**.

Step 12) At 23:00, January 20th (time point T**12**), the content-using device **700***a* transmits a polling command to the content management server **600***a* (Step S**212**). The content management server **600***a* receives the polling command from the content-using device **700***a*, and generates and transmits a polling Ack within a predetermined interval from the reception of the polling command (Step S**202**). The content management server **600***a*, at this point, determines that the content-using device **700***a* is online and updates the content management list **631** (Step S**203**). The content management list **631***a*, which corresponds to the content management list **631** following the update, is as illustrated in FIG. **46**. The content-using device **700***a* receives a polling Ack from the content management server **600***a* (Step S**212**). By receiving the polling Ack from the content management server **600***a*, the content-using device **700***a* determines that a notification has been made to the content management server **600***a* that the content-using device **700***a* is online (Step S**212**). The content-using device **700***a* updates the content management list **722** at time point T**13** (Step S**213**). The content management list **722***a*, which corresponds to the content management list **722** following the update, is as illustrated in FIG. **50**. Here, for instance, the validity duration of the content "Cont**1**" is "24H", and hence, the scheduled expiration time for the content "Cont**1**" is time point T**18**, which is calculated by adding "24H" to time point T**12**. In other words, the content "Cont**1**" is available for use from time point T**12** to time point T**18**.

Step 13) The content-using device **700***a* transitions from online to offline at 23:30, January 20th (time point T**15**). Even after transitioning from online to offline, the content-using device **700***a* is able to continue the use of the content "Cont**1**" since the scheduled expiration time of the content "Cont**1**" is "1/21, 23:00". Subsequently, the content-using device **700***a* transitions to online once again as the scheduled expiration time "1/21, 23:00" of the content "Cont**1**" approaches. In the example illustrated in FIG. **58**, the content-using device **700***a* transitions from offline to online at 22:00, January 21st, which is one hour before the scheduled expiration time. At time point T**16** immediately following 22:00, January 21st, which is the time point at which the content-using device **700***a* transitions from offline to online, the content-using device **700***a* transmits a polling command to the content management server **600***a* (Step S**214**). The content management server **600***a* receives the polling Ack from the content-using device **700***a* (Step S**204**). Then, within a predetermined interval from the reception of the polling command, the content management server **600***a* transmits a polling Ack to the content-using device **700***a* (Step S**204**). The content management server **600***a*, at this point, determines that the content-using device **700***a* is online and updates the content management list **631***a* (Step S**205**). A content management list **631***b*, which corresponds to the content management list **631***a* following the update, is as illustrated in FIG. **59**. In the content management list **631***b*, which corresponds to the content management list **631***a* following the update, "1/22, 22:00" is set in a scheduled expiration time field **636***b*, and "1/23, 22:00" is set

in a scheduled expiration time field **643***b*. The content-using device **700***a* receives a polling Ack from the content management server **600***a* (Step S**214**). By receiving the polling Ack from the content management server **600***a*, the content-using device **700***a* determines that a notification has been made to the content management server **600***a* that the content-using device **700***a* is online. Subsequently, the content-using device **700***a* updates the content management list **722***a* at time point T**17** (Step S**215**). A content management list **722***b*, which corresponds to the content management list **722***a* following the update, is as illustrated in FIG. **60**. In the content management list **722***b*, which corresponds to the content management list **722***a* following the update, "1/22, 22:00" is set in a scheduled expiration time field **737***b*, and "1/23, 22:00" is set in a scheduled expiration time field **741***b*.

Here, for instance, the validity duration of the content "Cont**1**" is "24H", and hence, the scheduled expiration time for the content "Cont**1**" is time point T**19**, which is calculated by adding "24H" to time point T**16**. In other words, the content "Cont**1**" is available for use, following time point T**17**, from time point T**16** to time point T**19**.

In the description provided above, the content-using device **700***a* returns to online once again at 22:00, January 21st. However, when the content-using device **700***a* does not return to online once again by 23:00, January 21st, which corresponds to the scheduled expiration time of the content "Cont**1**", the content-using device **700***a* is unable to use the content "Cont**1**" following 23:00, January 21st even when transmitting a polling command to the content management server **600***a* at a given point following 23:00, January 21st. This is since the scheduled expiration time of the content "Cont**1**" has already passed.

4.7. Effects Achieved by Embodiment 4

In embodiment 4, the content-using device performs polling with respect to the content management server at regular intervals. When receiving a polling command transmitted from the content-using device, the content management server determines that the content-using device having transmitted the polling command is online. When the content-using device requests for continuous use of a content even after a period of validity of the content has expired, the content-using device needs to perform polling with respect to the content management server, which is realized by the present embodiment. On the other hand, the content management server need not perform polling with respect to the content-using device in such a case. In addition, a content-using device that does not request for continuous use of a content whose scheduled expiration time has already passed does not perform polling. As such, traffic on the communication path can be reduced according to the present embodiment.

Further, according to the present embodiment, even when the content-using device transitions from online to offline during use of a content, the content-using device can extend the scheduled expiration time set to the content by performing polling with respect to the content management server within the period of validity of the content. As such, the content-using device need not be kept in an online state at all times.

5. Other Modifications

In the above, description has been provided on the present invention with reference to exemplary embodiments thereof. However, and as a matter of course, the present invention should not be construed as being limited to the embodiments above. For instance, at least the modifications such as presented in the following are included within the spirit and scope of the present invention.

(1) In embodiments 2, 3, and 4, the content management server, once determining that the content-using device is offline, no longer performs the online/offline detection, which involves performing polling at hourly intervals, with respect to the content-using device. However, the present invention is not limited to this.

That is, so as to simplify control to be performed by the content management server, the content management server may be configured to perform processing as described in the following.

The content management server performs polling at uniform intervals with respect to all content-using devices registered to the content-using device list, regardless of whether or not each of the content-using devices is online.

In addition, so as to reduce network traffic, the frequency at which the content management server performs polling with respect to content-using devices may be decreased to some degree.

(2) In embodiments 2, 3, and 4, the content management server/the content-using device may append signature data to polling commands, polling Ack signals, and online control signals transmitted therebetween. The provision of signature data to such signals serves as a countermeasure for preventing unauthorized copying of the signals. Note that, as already described above, an online control signal is a notification signal transmitted by the content-using device to the content management server when the content-using device self-detects an online state thereof.

In specific, the content management server/the content-using device generates signature data for each of the polling command, the polling Ack signal, and the online control signal by performing digital signature. Here, the generation of signature data is performed by using, for instance, a private key that is stored only to authentic devices. Subsequently, the signature data so generated are appended to each of the polling command, the polling Ack signal, and the online control signal. Subsequently, the polling command, the polling Ack signal, and the online control signal having signature data appended thereto are transmitted to the content management server/the content-using device.

The content management server/the content-using device receives the polling command, the polling Ack signal, and the online control signal having signature data appended thereto. Subsequently, verification of the signature data provided to the polling command, the polling Ack signal, and the online control signal so received is performed by using a public key corresponding to the private key. Only when the verification is successful, the content management server/the content-using devices use the polling command, the polling Ack signal, and the online control signal so received.

Here, the RSA signature method may be used as one example of a method for providing a digital signature to a command or a signal.

(3) In embodiment 3, each of a signal indicating the invalidation instruction and a signal indicating the invalidation response may have signature data identifying the content management server/the content-using device appended thereto for the purpose of preventing unauthorized copying thereof.

The generation of the signature data to be appended to such signals is performed in the above-described manner, by using a private key that is stored only to authentic devices and by performing digital signature with respect to the signals. Here, the RSA signature method may be used as one example of a method for providing a digital signature to a command or a signal.

On the side of the content-using device, verification is performed of whether signature data appended to such signals corresponds to an authentic content management server, and invalidation of an invalidation-target content is performed when the verification is successful. Note that the content-using device performs invalidation of an invalidation-target content by deleting the content, controlling operations of an application (i.e., by prohibiting playback upon recognition of playback of the content or the like), or deleting a key corresponding to the content.

FIG. **61** illustrates one example of a data configuration of an invalidation instruction. As illustrated in FIG. **61**, an invalidation instruction **351** includes an invalidation command **352**, a content management server name **353**, a content-using device name **354**, a content ID **355**, and signature data **356**.

The content management server generates a concatenated data by concatenating the invalidation command **352**, the content management server name **353**, the content-using device name **354**, and the content ID **355**. Subsequently, the content management server generates the signature data **356** by performing digital signature (S) with respect to the concatenated data so generated. Here, when performing the digital signature (S), the content management server uses a private key **361** held therein. Subsequently, the content management server generates the invalidation instruction **351** by appending the signature data **356** to the concatenated data.

Subsequently, the content management server transmits the invalidation instruction **351** to the content-using device.

The content-using device, when receiving the invalidation instruction **351**, checks whether or not a content-using device name corresponding thereto is included in the invalidation instruction **351** so received. When a content-using device name that corresponds to the content-using device is not included in the invalidation instruction **351**, the content-using device determines that the invalidation instruction is addressed thereto and discards the invalidation instruction **351** received.

When a content-using device name that corresponds to the content-using device is included in the invalidation instruction **351**, the content-using device verifies the authenticity of the signature data **356** included in the invalidation instruction **351** by using a public key corresponding to the private key **361**. When the authenticity of the signature data **356** cannot be determined, the content-using device discards the invalidation instruction **351** received. Further, the content-using device may be further configured so as to transmit, to the content management server, a notification indicating that the authenticity of the signature data **356** could not be determined in such a case.

When the authenticity of the signature data **356** is determined, the content-using device invalidates a content that has been provided from the content management server and that corresponds to the content ID **355** according to the invalidation command **352** included in the invalidation instruction **351** received.

An invalidation response may have the same data configuration as the invalidation instruction described above.

(4) In embodiments 2, 3, and 4, the content management sever manages the content-using device list and the offline device list as separate lists. However, the present invention is not limited to the management of lists being performed in such a manner.

That is, the content-using device list and the offline device list may be combined into a single content-using device list. In such a case, in the combined content-using device list, offline content-using devices may be indicated by providing, only to device information pieces corresponding to offline content-using devices, indication in the form of ticks or checks. In addition to this, the management of offline content-using devices may also be performed by providing, to each device information piece corresponding to an offline content-using device, an indication of a time point at which the corresponding content-using device has been detected as being offline.

(5) In embodiments 2, 3, and 4, polling is performed by the content management server at hourly intervals. However, the present invention is not limited to this.

That is, the polling may be performed once every two hours, once every six hours, once every twelve hours, etc., provided that the polling is performed at regular intervals. Further, polling may be performed with longer intervals therebetween during the nighttime compared to during the day time. Further, the frequency at which polling is performed may be determined depending upon load exerted upon applications and communication traffic.

Alternatively, the frequency at which polling is performed may be determined depending upon relative validity durations of contents. For instance, when a relative validity duration of a given content is ten hours, the polling may be performed once every two hours. By polling being performed in such a manner, even when a content-using device transitions from online to offline immediately before an invalidation instruction is transmitted thereto for invalidating a given content, the content is invalidated in twelve-hours' time, if not sooner, by the period of validity of the content expiring.

Alternatively, when a relative validity duration of a given content is ten days, polling may be performed once every two days. By polling being performed in such a manner, even when a content-using device transitions from online to offline immediately before an invalidation instruction is transmitted thereto for invalidating a given content, the content is invalidated in twelve days, if not sooner, by the period of validity of the content expiring.

In addition, it can be assumed that a relative validity duration of a given content is set in relation to the value of the given content. Due to this, a content having high value may be provided with a short relative validity duration. Further, in such a case, polling intervals may be determined in accordance with the relative validity duration of the content. By setting the relative validity duration for a content having high value so as to be shorter than a relative validity duration for a content of less value, the management of the timing at which invalidation of the content is performed when invalidation of the content is desired can be performed with an increase degree of accuracy.

(6) In embodiments 2, 3, and 4, the same relative validity duration is set with respect to one content regardless of the different content-using devices to which the content is provided. However, the present invention is not limited to this.

That is, different relative validity durations may be set with respect to a single content so as to correspond to the different content-using devices to which the content is provided. For instance, when a single content is shared by different users, when the reliability of a specific one of the users is high, the relative validity duration corresponding to the specific user may be set so as to be longer than those for other users.

(7) In embodiments 2, 3, and 4, when the content-using device transitions from offline to online, the content-using device notifies the content management server of the transition from offline to online. However, the present invention is not limited to this, and the content-using device need not make such a notification provided that the content management server performs polling continuously.

(8) In embodiment 3, description has been provided that displaying is performed of the state of invalidation. However, the present invention is not limited to this, and such displaying need not be performed. That is, accumulation may be performed of invalidation states, and reference may be made to such invalidation states only when necessary.

(9) In embodiments 2, 3, and 4, when the content-using device self-detects an online state, the content-using device makes a notification indicating an online state thereof to the content management server in the form of the online control signal. However, there may be cases where, even when a content-using device transmits an online control signal, the content management server cannot receive the online control signal for reasons such as the content management server being powered-off.

In such cases, the content-using device may repeatedly transmit the online control signal to the content management server until a response is received from the content management server indicating that the online control signal has been received.

Alternatively, a supplementary server may be separately provided. When a supplementary server is provided, the content-using device transmits the online control signal to the supplementary server. The supplementary server, when receiving the online control signal, stores the online control signal. Subsequently, the supplementary server reads out the online control signal stored therein. Following the reading of the online control signal, the supplementary server repeatedly transmits the online control signal to the content management server until a response is received from the content management server indicating that the online control signal has been received.

In the above-described case where a supplementary server is provided, the content management server, upon recovery, may first refer to the supplementary server and thereby obtain the online control signal from the supplementary server. Subsequently, the content management server performs processing such as the deletion, from the offline device list, of the content-using device having issued the online control signal and the updating of the content management list by using the online control signal obtained from the supplementary server. Further, when having output, to a content-using device, an invalidation instruction for invalidating the playback of a content by the content-using device, the content management server may, upon recovery, refer to the supplementary server. Subsequently, the content management server tries to acquire an online control signal. When an online control signal is successfully acquired from the supplementary server, the content management server transmits the invalidation instruction once again to the content-using device, which has now become online.

Alternatively, the content distribution system may be configured as described in the following.

As illustrated in FIG. **62**, a content distribution system **50** pertaining to one aspect of the present invention includes: a content management sever **800***a*; a content-using device **900***a*; and a relay server **950***a*. In the content distribution system **50**, the content management server **800***a* and the relay server **950***a* are connected via a network. Further, the content-using device **900***a* and the relay server **950***a* are also connected via a network.

The following explains purposes as to why the relay server **950***a* is incorporated in the content distribution system **50**.

The relay server **950***a* substitutes for the content management server **800***a*. The content management server **800***a*, after making a request for substitution to the relay server **950***a*, may be powered-off. Subsequently, when the content management server **800***a* is later powered-on, the relay server **950***a* transmits information accumulated therein to the content management server **800***a*.

(9-1) Operations of Content Distribution System **50** (Part 1)

In the following, description is provided on operations (part 1) of the content distribution system **50**, with reference to the sequence diagram illustrated in FIG. **63**.

The content management server **800***a* transmits, to the relay server **950***a*, an instruction for polling, an address, and a timing for performing polling (Step S**601**).

The content management server **800***a* transitions to a power-off state (Step S**612**).

The relay server **950***a* receives, from the content management server **800***a*, the instruction for polling, the address, and the timing for performing polling (Step S**601**). Subsequently, the relay server **950***a* stores therein the instruction for polling, the address, and the timing for performing polling received from the content management sever **800***a* (Step S**602**). Then, the relay server **950***a* makes a comparison between the current time point and the timing stored therein, and determines whether the current time point matches the timing stored therein (Step S**603**). When the current time point does not match the timing stored therein ("NO" in Step S**603**), the relay server **950***a* returns to the processing in Step S**603** and performs processing once again from Step S**603**.

When the current time point matches the timing stored therein ("YES" in Step S**603**), the relay server **950***a* generates a polling command by using the polling instruction and the address stored therein (Step S**604**). Subsequently, the relay server **950***a* transmits the polling command so generated to the content-using device **900***a* (Step S**605**).

The content-using device **900***a* receives the polling command from the relay server **950***a* (Step S**605**). Subsequently, the content-using device **900***a* generates a polling Ack (Step S**606**), and transmits the polling Ack so generated to the relay server **950***a* (Step S**607**).

The relay server **950***a* receives the polling Ack from the content-using device **900***a* (Step S**607**). Subsequently, the relay server **950***a* stores therein the polling Ack so received (Step S**608**).

At this point, the content management server **800***a* transitions to a power-on state (Step S**613**).

Subsequently, the relay server **950***a* checks whether a connection is established with the content management server **800***a* (Step S**609**). When determining that the content management server **800***a* is not connected therewith ("NO" in Step S**610**), the relay server **950***a* returns to Step S**609** and performs processing from Step S**609** once again. When determining that the content management server **800***a* is connected therewith ("YES" in Step S**610**), the relay server **950***a* reads out the polling Ack stored therein. Subsequently, the relay server **950***a* transmits the polling Ack so read out to the content management server **800***a* (Step S**611**).

(9-2) Operations of Content Distribution System **50** (Part 2)

In the following, description is provided on operations (part 2) of the content distribution system **50**, with reference to the sequence diagram illustrated in FIG. **64**.

The content-using device **900***a* transmits, to the relay server **950***a*, an instruction for polling, an address, and a timing for performing polling (Step S**621**).

The relay server **950***a* receives, from the content-using device **900***a*, the instruction for polling, the address, and the timing for performing polling (Step S**621**). Subsequently, the relay server **950***a* stores therein the instruction for polling, the address, and the timing for performing polling received from

the content-using device **900***a* (Step S**622**). Subsequently, the relay server **950***a* makes a comparison between the current time point and the timing stored therein, and determines whether the current time point matches the timing stored therein (Step S**623**). When the current time point does not match the timing stored therein ("NO" in Step S**623**), the relay server **950***a* returns to Step S**623** and performs processing from Step S**623** once again.

When the current time point matches the timing stored therein ("YES" in Step S**623**), the relay server **950***a* generates a polling command by using the polling instruction and the address stored therein (Step S**624**). Subsequently, the relay server **950***a* transmits the polling command generated to the content management server **800***a* (Step S**625**).

The content management server **800***a* receives the polling command from the relay server **950***a* (Step S**625**). Subsequently, the content management server **800***a* generates a polling Ack (Step S**626**), and transmits the polling Ack so generated to the relay server **950***a* (Step S**627**).

The relay server **950***a* receives the polling Ack from the content management server **800***a* (Step S**627**). Subsequently, the relay server **950***a* stores therein the polling Ack so received (Step S**628**). Subsequently, the relay server **950***a* checks whether a connection is established with the content-using device **900***a* (Step S**629**). When determining that the content-using device **900***a* is not connected therewith ("NO" in Step S**630**), the relay server **950***a* returns to Step S**629** and performs processing from Step S**629** once again. When determining that the content-using device **900***a* is connected therewith ("YES" in Step S**630**), the relay server **950***a* reads out the polling Ack stored therein. Subsequently, the relay server **950***a* transmits the polling Ack read out to the content-using device **900***a* (Step S**631**).

(9-3) Operations of Content Distribution System **50** (Part 3)

In the following, description is provided on operations (part 3) of the content distribution system **50**, with reference to the sequence diagram illustrated in FIG. **65**.

The content management server **800***a* generates an invalidation instruction for invalidating a given content (Step S**641**). Subsequently, the content management server **800***a* transmits the invalidation instruction generated to the relay server **950***a* (Step S**642**).

The content management server **800***a* transitions to a power-off state (Step S**654**).

The relay server **950***a* receives the invalidation instruction from the content management server **800***a* (Step S**642**). Subsequently, the relay server **950***a* stores therein the invalidation instruction received from the content management server **800***a* (Step S**643**). Then, the relay server **950***a* makes a comparison between the current time point and a timing stored therein. Here, the timing stored in the relay server **950***a* indicates a time point at which the invalidation instruction is to be transmitted to the content-using device **900***a*. The relay server **950***a* determines whether the current time point matches the timing stored therein (Step S**644**). When the current time point does not match the timing stored therein ("NO" in Step S**644**), the relay server **950***a* returns to Step S**644** and performs processing from Step S**644** once again.

When the current time point matches the timing stored therein ("YES" in Step S**644**), the relay server **950***a* checks whether a connection is established with the content-using device **900***a* (Step S**645**). When determining that the content-using device **900***a* is not connected therewith ("NO" in Step S**646**), the relay server **950***a* returns to Step S**644** and performs processing from Step S**644** once again. When determining that the content-using device **900***a* is connected therewith ("YES" in Step S**646**), the relay server **950***a* reads out the invalidation instruction stored therein. Subsequently, the relay server **950***a* transmits the invalidation instruction read out to the content-using device **900***a* (Step S**647**).

The content-using device **900***a* receives the invalidation instruction from the relay server **950***a* (Step S**647**). Upon receiving the invalidation instruction, the content-using device **900***a* performs invalidation processing (Step S**648**). Subsequently, the content-using device **900***a* generates an invalidation response indicating that the invalidation processing has been completed, and transmits the invalidation response generated to the relay server **950***a* (Step S**649**).

The relay server **950***a* receives the invalidation instruction from the content-using device **900***a* (Step S**649**). Subsequently, the relay server **950** stores therein the invalidation response received (Step S**649**).

At this point, the content management server **800***a* transitions to a power-on state (Step S**655**).

Subsequently, the relay server **950***a* checks whether a connection is established with the content management server **800***a* (Step S**651**). When determining that the content management server **800***a* is not connected therewith ("NO" in Step S**652**), the relay server **950***a* returns to Step S**651** and performs processing from Step S**651** once again. When determining that the content management server **800***a* is connected therewith ("YES" in Step S**652**), the relay server **950***a* reads out the invalidation response stored therein. Subsequently, the relay server **950***a* transmits the invalidation response read out to the content management server **800***a* (Step S**653**).

(9-4) Operations of Content Distribution System **50** (Part 4)

In the following, description is provided on operations (part 4) of the content distribution system **50** which differ from the operations described above, with reference to the sequence diagram illustrated in FIG. **66**.

The content management server **800***a* generates an invalidation instruction for invalidating a given content with respect to the content-using device **900***a* (Step S**661**). The invalidation instruction includes a content-using device name identifying the content-using device **900***a*. Subsequently, the content management server **800***a* transmits the invalidation instruction so generated to the relay server **950***a* (Step S**662**).

The relay server **950***a* receives the invalidation instruction from the content management server **800***a* (Step S**662**). Subsequently, the relay server **950***a* stores therein the invalidation instruction received from the content management server **800***a* (Step S**663**).

The content-using device **900***a* generates a polling command (Step S**660**). The polling command includes a content-using device name identifying the content-using device **900***a*. Subsequently, the content-using device **900***a* transmits the polling command generated to the relay server **950***a* (Step S**664**).

The relay server **950***a* receives the polling command from the content-using device **900***a* (Step S**664**). Subsequently, the relay server **950***a* extracts the content-using device name from the polling command received. Then, the relay server **950***a* searches, among invalidation instructions stored therein, for an invalidation instruction including the same content-using device name as the content-using device name extracted (Step S**665**). When an invalidation instruction including the same content-using device name exists ("Exists" in Step S**666**), the relay server **950***a* generates a response that includes the invalidation instruction including the same content-using device name and that includes indication that an invalidation instruction including the same content-using device name exists (Step S**667**). On the other hand, when an

invalidation instruction including the same content-using device name does not exist ("Does not exist" in Step S**666**), the relay server **950***a* generates a response that includes indication that an invalidation instruction including the same content-using device name does not exist (Step S**668**). Subsequently, the relay server **950***a* transmits the response generated to the content-using device **900***a* (Step S**669**).

The content-using device **900***a* receives a response from the relay server **950***a* (Step S**669**). Subsequently, the content-using device **900***a* determines whether or not an invalidation instruction exists according to the response received (Step S**670**). When an invalidation instruction does not exist ("Invalidation instruction does not exist" in Step S**670**), the content-using device **900***a* does not perform any processing. When an invalidation instruction exists ("Invalidation instruction exists" in Step S**670**), the content-using device **900***a* performs invalidation processing according to the invalidation instruction included in the response (Step S**671**). Subsequently, the content-using device **900***a* generates an invalidation response indicating that the invalidation processing has been completed, and transmits the invalidation response generated to the relay server **950***a* (Step S**672**).

The relay server **950***a* receives the invalidation instruction from the content-using device **900***a* (Step S**672**). Subsequently, the relay server **950***a* transmits the invalidation response received to the content management server **800***a* (Step S**673**).

(10) In embodiment 4, the content-using device may transmit polling commands at regular intervals. In addition, the time point at which polling is to be performed may set in view of a schedule expiration time. For instance, the content-using device may transmit a polling command at a time point that precedes the scheduled expiration time by a predetermined period of time.

By configuring the content-using device so as to perform the transmission of the polling command at regular intervals, the content management server is able to perform the determination of whether or not the content-using device is online or offline at regular intervals.

In addition, by configuring the content-using device so as to transmit the polling command at time points set taking into consideration a scheduled expiration time, traffic load can be decreased.

(11) In embodiment 3, the content management server transmits an invalidation instruction to the content-using device. However, the present invention is not limited to this.

That is, the content management server may transmit an instruction for changing conditions of use of a content to the content-using device instead of transmitting an invalidation instruction. The content-using device, when receiving the instruction for changing conditions of use of a content from the content management server, changes the conditions of use applied to the content immediately.

Note that here, the conditions of use of a given content may include conditions pertaining to playback of the content, conditions pertaining to the copying and the redistribution of the content, conditions pertaining to secondary use of the content, etc. In specific, the conditions pertaining to playback of the content are, for instance, the number of times the content can be played back, the resolution applied to the content when played back, and the length of the validity duration of the content. Further, conditions pertaining to the copying and the redistribution of the content are, for instance, the number of times the content can be copied, and a range of users to which the content can be redistributed. Finally, the conditions pertaining to secondary use of the content are, for instance, whether or not partial use of the content is permitted, etc.

The content-using device, when receiving the instruction for changing conditions of use of the content from the content management server, is able to immediately change the conditions of use applied to the content.

Further, when the content-using device is offline when the content management server has transmitted the instruction for changing conditions of use of the content thereto, processing is performed as described in the following.

When the content-using device, which was previously offline, transitions from offline to online, makes an inquiry to the content management server. In response to the inquiry made from the content-using device, the content management server transmits new conditions of use of the content along with the content or a key. The content-using device, when receiving the new conditions of use of the content, updates the conditions of use of the content with the new conditions of use of the content so received.

In addition, in embodiment 3, the content-using device stops the use of a content or invalidates the content when the validity duration of the content expires. However, the present invention is not limited to this. That is, the content-using device may determine in advance and hold default conditions of use of the content, and when the validity duration of the content expires, may refer to the default conditions of use of the content.

(12) The content-using device may delete a content stored thereby as described in the following. Note that the deletion of the content by the content-using device as described in the following is referred to hereinafter as "self-deletion" of the content.

In embodiment 2, when a user performs user operations with respect to the content-using device **200** before the scheduled expiration time of the content is reached, the content-using device **200** may perform self-deletion of the content.

(12-1) The following describes operations involved in self-deletion performed by the content-using device **200** when deleting a content identified by "Cont**1**" in the content ID field **251** included in the content management list **222** in FIG. **12** before "1/20, 23:30" indicated in the scheduled expiration time field **254**. Note that, the content-using device **200** is currently offline when performing the self-deletion in this example.

First, the content management control unit **221** deletes the content "Cont**1**". Subsequently, the content management control unit **221** additionally writes, to the scheduled expiration time field **254** corresponding to the content ID "Cont**1**" in the content ID field **251** in the content management list **222**, information indicating that "the content has already been deleted".

Here, the content management control unit **221** may additionally write, to the scheduled expiration time field **254**, a time point at which the content "Cont**1**" has been self-deleted by the content-using device **200**. In addition, the determination of whether or not to additionally write, to the scheduled expiration time field **254**, the time point at which the content has been self-deleted may be made depending upon specifications made with respect to the content-using device **200**. In addition, whether or not the time point at which the content "Cont**1**" has been self-detected is to be written to the scheduled expiration time field **254** in the content management list **222** may be specified by the content management server **100** as one of the rules pertaining to the use of the content "Cont**1**".

Subsequently, the content-using device **200**, when transitioning from offline to online once again, outputs the online control signal indicating the transition from offline to online to the content management server **100**. Here, along with the

online control signal, the content-using device **200** may notify the content management server **100** of the actual time point at which the content "Cont**1**" has been self-deleted. When receiving such a notification from the content-using device **200**, the content management control unit **130** of the content management server **100** updates the content management list **131** so as to be consistent with the information included in the notification.

Subsequently, the content management control unit **221** of the content-using device **200** deletes the content "Cont**1**" from the content management list **222**.

In the following, description is provided on operations of the content-using device **200** when performing self-deletion of a content before the scheduled expiration time set with respect to the content is reached, with reference to the sequence diagram illustrated in FIG. **67**.

The content management control unit **221** of the content-using device **200** receives a content ID identifying a content that is to be self-deleted (Step S**701**).

Subsequently, the content management control unit **221** reads out, from the content management list **222**, a content management information piece including the content ID (Step S**702**).

Subsequently, the content management control unit **221** determines whether the current time point is before the scheduled expiration time included in the content management information piece read out (Step S**703**).

When determining that the current time point is before the scheduled expiration time ("YES" in Step S**703**), the content management control unit **221** receives a specification of whether or not to store a time point at which the self-deletion is performed (Step S**704**). Subsequently, the content management control unit **221** deletes the content identified by the content ID from the content storage unit **224** (Step S**705**).

Following the deletion of the content, when a specification has been made for storing the time point at which the self-deletion is performed ("Made" in Step S**706**), the content management control unit **221** writes, to the scheduled expiration time included in the content management information piece, an indication of "Deleted" and the time point at which the self-deletion has been performed. On the other hand, when a specification has not been made for storing the time point at which the self-deletion is performed ("Not made" in Step S**706**), the content management control unit **221** writes, to the scheduled time included in the content management information, an indication of "Deleted".

Subsequently, the online/offline notification detection unit **201** of the content-using device **200** checks whether the content-using device **200** is connected with the content management server **100** (Step S**709**). When the content-using device **200** is not connected with the content management server **100** ("NO" in Step S**709**), the online/offline notification detection unit **201** returns to Step S**709** and performs processing from Step S**709** once again.

When the content-using device **200** is connected with the content management server **100** ("YES" in Step S**709**), the online control transmission unit **213** notifies the content management server **100** that the content has been deleted (Step S**710**).

Subsequently, the content management control unit **221** of the content-using device **200** deletes the content management information piece from the content management list **222** (Step S**711**).

The online control reception unit **113** of the content management server **100** receives a notification indicating that the content has been deleted from the content-using device **200** (Step S**710**). Subsequently, the content management control unit **130** deletes, from the content management list **131**, a usage device information piece included in the corresponding management information piece. Here, the corresponding management information piece includes a content ID identifying the content having been deleted. In addition, the usage device information piece includes a usage device name identifying the content-using device having deleted the content (Step S**712**).

(12-2) The following describes operations involved in self-deletion performed by the content-using device **200** when deleting a content identified by "Cont**2**" in the content ID field **255** included in the content management list **222***a* illustrated in FIG. **12** while the content-using device **200** is online.

Note that in the content management list **222***a*, "---" is stored in the scheduled expiration time field corresponding to the content while the content-using device **200** is online. The indication of "---" as the scheduled expiration time indicates that the viewing of the content can be performed whenever desired and for an unlimited period of time as long as the content-using device **200** is online.

The content-using device **200** deletes the content. Subsequently, the content-using device **200** notifies the content management server **100** that the content has been deleted.

The content management server **100** immediately updates the content management list **131** so as to be consistent with the deletion of the content.

In addition, the content-using device **200** deletes, from the content management list **222**, a content management information piece including the content ID "Cont**2**".

Here, note that the content management server **100** may be configured to keep a record of the deletion of the content. That is, the content management server **100** may keep a record indicating that the content was once shared with the content-using device but later deleted by the content-using device. By configuring the content management server **100** in such a manner, the content management server **100**, when issuing an invalidation instruction, may display the following message, for example, by referring to the record.

"Cont**1** was used by C**1**, C**2**, and C**3**. Cont**1** provided to each of C**1**, C**2**, and C**3** has been invalidated immediately. Cont**1** provided to C**1** was deleted before the instruction for invalidation was made."

As a matter of course, the above message may be replaced by the following message: "Cont**1** was used by C**1**, C**2**, and C**3**. Cont**1** provided to each of C**1**, C**2**, and C**3** has been invalidated immediately."

In the following, description is provided on operations of the content-using device **200** when performing self-detection of a content before the scheduled expiration time set with respect to the content is reached, with reference to the sequence diagram illustrated in FIG. **68**.

The content management control unit **221** of the content-using device **200** receives a content ID identifying a content to be self-deleted (Step S**721**).

Subsequently, the content management control unit **221** reads out, from the content management list **222**, a content management information piece including the content ID (Step S**722**).

Subsequently, the content management control unit **221** deletes the content identified by the content ID (Step S**723**).

The online control transmission unit **213** notifies the content management server **100** that the content has been deleted (Step S**724**).

Subsequently, the content management control unit **221** of the content-using device **200** deletes the content management information piece from the content management list **222** (Step S**725**).

The online control reception unit **113** of the content management server **100** receives a notification indicating that the content has been deleted from the content-using device **200** (Step S**724**). Subsequently, the content management control unit **130** deletes, from the content management list **131**, a usage device information piece included in the corresponding management information piece. Here, the corresponding management information piece includes a content ID identifying the content having been deleted. In addition, the usage device information piece includes a usage device name identifying the content-using device having deleted the content (Step S**726**).

(13) Modification may be performed as described in the following.

For instance, the content-using device **200** includes: the online/offline notification detection unit **201**; the content control unit **202**; and the time measurement unit **203**, as illustrated in FIG. **2**. Each of the online/offline notification detection unit **201**, the content control unit **202**, and the time measurement unit **203** is implemented as a combination of a CPU and an application program stored onto a memory.

As such, in the content-using device **200**, a plurality of application programs (hereinafter referred to simply as "applications") are caused to operate. By such applications operating, the online/offline notification detection unit **201**, the content control unit **202**, and the time measurement unit **203** are each able to realize the respective functions.

When multiple applications are operated in the content-using device **200**, each application is either in (a) a state where the application is launched and operating or (b) a state where the application is launched and operating in the background.

In specific, the content control unit **202**, which is one of the applications, measures the elapse of a period of validity of a content having a scheduled expiration time set thereto.

At one point in processing, the content control unit **202** may be in either one of the two states (a) and (b) described above.

The content control unit **202**, in either one of the two states (a) and (b), measures the elapse of a period of validity of a content having a period of validity set thereto.

The content control unit **202** includes a counter unit and other processing units. The counter unit measures the elapse of the period of validity of the content having a period of validity set thereto. When the content control unit **202** is in state (b), the counter unit, alone, is in state (a) at all times.

The content control unit **202** may be configured to measure the elapse of the period of validity of the content having a period of validity set thereto when in state (a). Alternatively, the content control unit **202** may be configured not to measure the elapse of the period of validity when in state (b).

(14) FIG. **69** illustrates a content management list **222***b*, which is another example of the content management list **222** illustrated in FIG. **12**. The content management list **222***b* in FIG. **69** includes, for instance, the content management information piece **266**, the content management information piece **267**, and a content management information piece **268**.

The content management information piece **266** includes: "Cont**1**" in the content ID field **251**; "24H" in the relative validity duration field **252**; "S**1**" in the content management server name field **253**; and "1/20, 23:30" in the scheduled expiration time field **254**. The content management information piece **266** indicates that the content-using device **200** is not connected with the content management server "S**1**" and that the content-using device **200** is offline.

The content management information piece **267** includes: "Cont**2**" in the content ID field **255**; "48H" in the relative validity duration field **256**; "S**1**" in the content management server name field **257**; and "1/21, 23:30" in the scheduled expiration time field **258**. The content management information piece **267** also indicates that the content-using device **200** is not connected with the content management server "S**1**" and that the content-using device is offline.

The content management information piece **268***b* includes: "Cont**3**" in the content ID field **259**; "24H" in the relative validity duration field **260**; "S**2**" in the content management server name field **261**; and "---" in a scheduled expiration time field **262***b*. The content management information piece **268***b* indicates that the content "Cont**3**" has been supplied from the content management server "S**1**". Further, the content management information piece **268***b* also indicates that the content-using device **200** is connected with the content management server "S**2**" and that the content-using device is online.

As such, the content-using device is not connected with a first content management server, and thus, is offline with respect to the first content management server. In contrast, the content-using device is connected with a second content management server, and thus, is offline with respect to the second content management server.

(15) The content management server distributes a personal content to the content-using device. The content-using device uses the content. Later, the content-using device, upon being provided with instructions from the content management server, stops playback of the personal content accumulated therein or invalidates the personal content accumulated therein.

By deletion of a personal content being performed in such a concern-free manner, a person who desires to distribute a content is able to distribute the content without any concerns.

The content management server determines an online/offline state of the content-using device by performing polling with respect to the content-using device. When the content-using device is in online, the content management server transmits an invalidation instruction instructing the content-using device to invalidate playback of a content via the communication path. On the other hand, when the content-using device is offline, the content-using device performs self-detection of the offline state thereof by detecting deactivation of an communication module or the like, and performs control such that playback of a content is automatically invalidated when a period of validity of the content expires. The content management server, when the content-using device is offline, is able to keep track of whether or not the content has been invalidated by managing the period of validity of the content.

(16) Examples of the content as described above include: music data, audio data, a moving image, a still image, movie data constituted of a moving image and audio data, a database, a spreadsheet, text data, and a computer program.

The use/playback of a content as discussed above may refer to playing back music data, audio data, a moving image, a still image, or movie data constituted of a moving image and audio data. In addition, the use/playback of a content as discussed above may refer to performing operations such as reading out, writing into, updating, and displaying with respect to data stored in a database or a spreadsheet, or text data. Further, the use/playback of a content as discussed above may refer to causing a processor to operate in accordance with a computer program.

(17) The present invention may be implemented as described in the following.

Another aspect of the present invention is a content-using device that holds and uses a content distributed thereto from a content management server, comprising: a detection unit that detects whether the content-using device is in an online

state of being connected with the content management server or in an offline state of being unconnected with the content management server; a setting unit that sets a period of validity for using the content when the content-using device is detected as being in the offline state; and a control unit that monitors elapse of the period of validity, and permits the use of the content before the elapse of the period of validity and prohibits the use of the content after the elapse of the period of validity.

In the content-using device, the detection unit may output a detection time at which the offline state of the content-using device is detected, and the control unit may hold a relative validity duration during which the use of the content is permitted and may calculate the period of validity by adding the relative validity duration to the detection time when the content-using device is detected as being in the offline state.

In the content-using device, when the detection unit detects that the content-using device is in the online state at a time point after the period of validity is set with respect to the content due to the content-using device being previously detected as being in the offline state and before the elapse of the period of validity, the setting unit may cancel the period of validity set with respect to the content, and when the period of validity is not set with respect to the content, the control unit may permit the use of the content at all times.

In the content-using device, the setting unit may hold a content management list in which a content identifier identifying the content and the relative validity duration are stored in an associated state, and may store the period of validity of the content in association with the content identifier in the content management list when the content-using device is detected as being in the offline state, and the control unit may monitor the elapse of the period of validity stored in the content management list.

In the content-using device, when the detection unit detects that the content-using device is in the online state at a time point after the period of validity is set with respect to the content due to the content-using device being previously detected as being in the offline state and before the elapse of the period of validity, the setting unit may delete the period of validity stored in the content management list.

The content-using device may further comprise a reception unit that receives, from the content management server, an invalidation instruction for invalidating the content, wherein the setting unit may set a second period of validity for using the content when the invalidation instruction is received, and the control unit may monitor elapse of the second period of validity of the content and may permit the use of the content before the elapse of the second period of validity and prohibit the use of the content after the elapse of the second period of validity.

The content-using device may further comprise a transmission/reception unit that performs polling with respect to the content management server and receives a first response to the polling from the content management server, wherein the setting unit may set a third period of validity for use of the content when the first response is received, and the control unit may monitor elapse of the third period of validity of the content and may permit the use of the content before the elapse of the third period of validity and prohibit the use of the content after the elapse of the third period of validity.

In the content-using device, the transmission/reception unit may perform polling with respect to the content management server before the elapse of the third period of validity and may receive a second response to the polling from the content management server, the setting unit may set a fourth period of validity for use of the content when the second response is received, and the control unit may monitor elapse of the fourth period of validity of the content and may permit the use of the content before the elapse of the fourth period of validity and prohibit the use of the content after the elapse of the fourth period of validity.

Another aspect of the present invention is a content-using device that holds and uses a content distributed thereto from a content management server, comprising: a detection circuit that detects whether the content-using device is in an online state of being connected with the content management server or in an offline state of being unconnected with the content management server; a setting circuit that sets a period of validity for using the content when the content-using device is detected as being in the offline state; and a control circuit that monitors elapse of the period of validity, and permits the use of the content before the elapse of the period of validity and prohibits the use of the content after the elapse of the period of validity.

Another aspect of the present invention is an integrated circuit incorporated in a content-using device that holds and uses a content distributed thereto from a content management server, comprising: a detection circuit that detects whether the content-using device is in an online state of being connected with the content management server or in an offline state of being unconnected with the content management server; a setting circuit that sets a period of validity for using the content when the content-using device is detected as being in the offline state; and a control circuit that monitors elapse of the period of validity, and permits the use of the content before the elapse of the period of validity and prohibits the use of the content after the elapse of the period of validity.

Another aspect of the present invention is a content-using device that holds and uses a content distributed thereto from a content management server, comprising: a memory unit that stores a computer program being a combination of a plurality of computer instructions; and a processor that fetches, from the computer program stored in the memory unit, the computer instructions one by one, reads the computer instructions fetched, and operates according to a result of the reading, wherein the computer program causes a computer to: detect whether the content-using device is in an online state of being connected with the content management server or in an offline state of being unconnected with the content management server; set a period of validity for using the content when the content-using device is detected as being in the offline state; and perform control of monitoring elapse of the period of validity, and permitting the use of the content before the elapse of the period of validity and prohibiting the use of the content after the elapse of the period of validity.

Another aspect of the present invention is a computer program used in a content-using device that holds and uses a content distributed thereto from a content management server, comprising: a detection step of detecting whether the content-using device, which is a computer, is in an online state of being connected with the content management server or in an offline state of being unconnected with the content management server; a setting step of setting a period of validity for using the content when the content-using device is detected as being in the offline state; and a controlling step of monitoring elapse of the period of validity, and permitting the use of the content before the elapse of the period of validity and prohibiting the use of the content after the elapse of the period of validity.

Another aspect of the present invention is a computer-readable recording medium that stores thereon a computer program used in a content-using device that holds and uses a content distributed thereto from a content management

server, wherein the computer program comprises: a detection step of detecting whether the content-using device, which is a computer, is in an online state of being connected with the content management server or in an offline state of being unconnected with the content management server; a setting step of setting a period of validity for using the content when the content-using device is detected as being in the offline state; and a controlling step of monitoring elapse of the period of validity, and permitting the use of the content before the elapse of the period of validity and prohibiting the use of the content after the elapse of the period of validity.

Another aspect of the present invention is a content distribution system including: a content management server that manages a content; and a content-using device that uses the content, wherein the content management server comprises: a first online/offline detection unit that detects whether the content-using device is online or offline with respect to the content management server; a device management unit that manages an online/offline state of the content-using device; and a content management unit that manages a state of use of the content in the content-using device, and the content-using device comprises: a second online/offline detection unit that detects whether the content-using device is online or offline with respect to the content management server; and a content control unit that manages a period of validity of the content and controls the use of the content according to the detection by the second online/offline control unit. This enables the content-using device to perform the use of the content according to the whether the content-using device is online or offline with respect to the content management server. At the same time, the content management server manages a state of use of the content in the content-using device.

According to the above-described aspect of the present invention, management of the content according to the period of validity of the content is possible after the content-using device becomes offline. In addition, the content management server is able to perform management of the content-using device which involves detecting whether the content-using device is online or offline and determining when the period of validity of the content expires. Further, by reflecting the results obtained through such management to the management of the content, the content management server is able to immediately acknowledge a state of invalidation of the content when an invalidation instruction for instructing the content-using device to invalidate the content is issued with respect to the content-using device. This means that, in a case where a given content has been distributed to several content-using devices, the content management server is able to immediately acknowledge how many of the content-using devices are online and have performed the invalidation of the content. In addition, with regards to the content devices that are offline, the content management server is able to quickly acknowledge when the period of validity of the content expires in each of the content-using devices. This enables a user is able to confirm the invalidation of the content in each of the content-using devices that the content has been distributed to, and therefore, is released from concerns.

In the content distribution system, the content control unit of the content-using device may commence management of the content according to the period of validity of the content when the second online/offline detection unit detects that the content-using device has transitioned from online to offline, and may stop or deny the use of the content when the period of validity of the content expires, and when the first online/offline detection unit detects that the content-using device has transitioned from online to offline, the device management unit may register the content-using device as being offline, and the content management unit may set a period of validity with respect to the content. This enables the content-using device to perform the management of the content according to the period of validity of the content only after becoming offline with respect to the content management server.

In the content distribution system, the content control unit of the content-using device may cancel the period of validity set with respect to the content when the second online/offline detection unit detects that the content-using device has transitioned from offline to online, and when the first online/offline detection unit detects that the content-using device has transitioned from offline to online, the device management unit may cancel the offline registration of the content-using device, and the content management unit may cancel the period of validity set with respect to the content. This enables the content-using device to not perform the management of the content according to the period of validity of the content after the content-using device has become online with respect to the content management server.

In the content distribution system, the content control unit of the content-using device may update the period of validity set with respect to the content when the second online/offline detection unit detects that the content-using device is online, and when the first online/offline detection unit of the content management server detects that the content-using device is online, the content management unit may update the period of validity set with respect to the content. This enables the content-using device to perform the use of the content according to the period of validity of the content and update the period of validity after the content-using device becomes online with respect to the content management server.

In the content distribution system, the content management server may further comprise: an invalidation instruction reception unit that receives an invalidation instruction for invalidation of the content; an invalidation instruction transmission unit that transmits the invalidation instruction to the content-using device; and an invalidation response reception unit that receives an invalidation response from the content-using device as a response to the invalidation instruction, the content-using device may further comprise: an invalidation instruction reception unit that receives the invalidation instruction from the content management server when the content-using device is online; an invalidation unit that invalidates the content according to the invalidation instruction; and an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server, the invalidation instruction transmission unit of the content management server transmits the invalidation instruction to the content-using device according to (i) the online/offline state of the content-using device managed by the device management unit or (ii) the state of use of the content in the content-using device managed by the content management unit, the device management unit of the content management server updates the online/offline state of the content-using device when the invalidation response is received from the content-using device, and the content management unit of the content management server updates the state of use of the content in the content-using device when the invalidation response is received from the content-using device. This enables the content management server to immediately instruct the content-using device, when online, to perform the invalidation of the content. On the other hand, this enables the content-using device, when offline, to automatically invalidate the content after the period of validity of the content expires.

Another aspect of the present invention is a content management server in a content distribution system including the content management server, which manages a content, and a content-using device that uses the content, the content management server comprising: a first online/offline detection unit that detects whether the content-using device is online or offline with respect to the content management server; a device management unit that manages an online/offline state of the content-using device; and a content management unit that manages a state of use of the content in the content-using device. This enables the content management server to manage how the content is managed in the content-using device.

In the content management sever, when the first online/offline detection unit detects that the content-using device has transitioned from online to offline, the device management unit may register the content-using device as being offline, and the content management unit may set a period of validity with respect to the content. This enables the content management server to manage, according to the online/offline state of the content-using device, how the content is being managed in the content-using device.

In the content management sever, when the first online/offline detection unit detects that the content-using device has transitioned from offline to online, the device management unit may cancel the offline registration of the content-using device, and the content management unit may cancel the period of validity set with respect to the content. This enables the content management server to not perform the management of the content according to the period of validity of the content after the content-using device has become online with respect to the content management server.

In the content management server, when the first online/offline detection unit detects that the content-using device is online, the content management unit may update the period of validity set with respect to the content. This enables the content management server to permit the content-using device, when online, to update the period of validity set with respect to the content.

In the content management sever, the first online/offline detection unit may perform polling with respect to the content-using device at a predetermined timing, detect that the content-using device is online when receiving a polling response from the content-using device in response to the polling, and detect that the content-using device is offline when the polling response is not received from the content-using device within the predetermined interval. This enables the content management server to detect whether the content-using device is online or offline.

In the content management sever, the first online/offline detection unit may determine the predetermined timing according to a period of validity of the content. This enables the content management server to accurately manage, by using the content management unit, actually when the period of validity of the content expires in the content-using device.

In the content management server, the first online/offline detection unit, when receiving polling from the content-using device at a predetermined timing, may detect that the content-using device is connected with the content management server, and transmit a polling response to the content-using device. This enables the content management server to detect that the content-using device is online, and to permit the content-using device to update the period of validity set with respect to the content.

In the content management server, the first online/offline detection unit may detect that the content-using device is online when receiving a notification from the content-using device that the content-using device is online. This enables the content management server to immediately detect that the content-using device, which was previously offline, has become online.

The content management server further may comprise: an invalidation instruction reception unit that receives an invalidation instruction for invalidation of the content; an invalidation instruction transmission unit that transmits the invalidation instruction to the content-using device; and an invalidation response reception unit that receives an invalidation response from the content-using device as a response to the invalidation instruction, wherein the invalidation instruction transmission unit of the content management server may transmit the invalidation instruction to the content-using device according to (i) the online/offline state of the content-using device managed by the device management unit or (ii) the state of use of the content in the content-using device manages by the content management unit, the device management unit of the content management server may update the online/offline state of the content-using device when the invalidation response is received from the content-using device, and the content management unit of the content management server may update the state of use of the content in the content-using device when the invalidation response is received from the content-using device. This enables the content management server to immediately instruct the content-using device, when online, to perform the invalidation of the content.

The content management server may further comprise an invalidation display unit that displays a status of the invalidation of the content by referring to the invalidation response received from the content-using device, wherein the invalidation display unit, (i) may display invalidation completion information indicating that the invalidation of the content has been completed by the content-using device, when connected with the content management server, and, (ii) may display a period of validity of the content set in the content-using device, when unconnected with the content management server. This enables the content management server to acknowledge the status of the invalidation of the content by the content-using device performed in accordance with the invalidation instruction or the period of validity of the content.

The content management server may further comprise a display unit that displays how the management of the content is being performed. This enables a user of the content management server to acknowledge the online/offline state of the content-using device and the period of validity of the content.

Another aspect of the present invention is a content-using device in a content distribution system including a content management server that manages a content, and the content-using device, which uses the content, the content-using device comprising: a second online/offline detection unit that detects whether the content-using device is online or offline with respect to the content management server; and a content control unit that manages a period of validity of the content and controls the use of the content according to the detection by the second online/offline control unit. This enables the content-using device, when offline, to perform the management of the content according to the period of validity of the content.

In the content-using device, the content control unit may commence management of the content according to the period of validity of the content when the second online/offline detection unit detects that the content-using device has transitioned from online to offline, and may stop or deny the use of the content when the period of validity of the content expires. This enables the content-using device to commence

the management of the content according to the period of validity of the content when actually detected as being offline, and hence, to take full advantage of the predetermined period of validity of the content.

In the content-using device, when the second online/offline detection unit detects that the content-using device has transitioned from offline to online, the content control unit may cancel the period of validity set with respect to the content. This enables the content-using device not to perform the management of the content according to the period of validity of the content after the content-using device has become online with respect to the content management server.

In the content-using device, after the second online/offline detection unit detects that the content-using device is online, the content control unit may update the period of validity set with respect to the content at a point when the content-using device is detected as being online. This enables the content-using device to update the period of validity set with respect to the content according to permission from the content management server receivable when connected with the content management server.

In the content-using device, the second online/offline detection unit may receive polling from the content management server at a predetermined timing, generate a polling response as a response to the polling, and transmit the polling response to the content management server, and the second online/offline detection unit may detect that the content-using device is online or offline by using either one of or any combination of: a polling detection unit that detects whether or not the polling is received at the predetermined timing; an activation detection unit that detects activation of a communication module provided to the content-using device; a detection unit that detects whether or not the content-using device is located within a distance, from an access point, within which radio signals from the content-using device reach the access point; and a communication on/off operation detection unit that detects whether or not a user operation of turning on/off communication has been received. This enables the content-using device to detect the online/offline state thereof with respect to the content management device and thereby perform content control in accordance with the online/offline state thereof.

In the content-using device, the second online/offline detection unit, when detecting that the content-using device is online, may perform polling with respect to the content management server and receive a polling response from the content management server as a response to the polling, and the content control unit, when the polling response permits update of a period of validity set with respect to the content, may perform the update of the period of validity set with respect to the content. This enables the content-using device to receive a polling response from the content management server and to update the period of validity for using the content.

In the content-using device, the second online/offline detection unit may determine a timing at which the polling is performed according to the period of validity set with respect to the content. This enables the content-using device to notify the content management server of when the period of validity of the content expires with high accuracy.

In the content-using device, the second online/offline detection unit, when detecting that the content-using device is online, may transmit a notification to the content management server that the content-using device is online, and the second online/offline detection unit may detect that the content-using device is online or offline by using either one of or any combination of: a polling detection unit that detects whether or not the polling is received at the predetermined timing; an activation detection unit that detects activation of a communication module provided to the content-using device; a detection unit that detects whether or not the content-using device is located within a distance, from an access point, within which radio signals from the content-using device reach the access point; and a communication on/off operation detection unit that detects whether or not a user operation of turning on/off communication has been received. This enables the content-using device to immediately notify the content management server of the online state thereof.

The content-using device may further comprise: an invalidation instruction reception unit that receives an invalidation instruction from the content management server; an invalidation unit that invalidates the content according to the invalidation instruction; and an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server. This enables the content-using device to immediately invalidate the content according to the invalidation instruction from the content management server.

The content-using device may further comprise an invalidation display unit that displays a record of the invalidation of the content when the invalidation unit has invalidated the content. This enables a user of the content-using device to acknowledge information pertaining to the invalidation of the content.

The content-using device may further comprise a display unit that displays how the control of the use of the content is being performed by the content control unit. This enables a user of the content-using device to acknowledge the period of validity of the content, etc.

Another aspect of the present invention is a content distribution method for use in a content distribution system including: a content management server that manages a content; and a content-using device that uses the content, wherein the content management method comprises: a first online/offline detection step, by the content management server, of detecting whether the content-using device is online or offline with respect to the content management server; a device management step, by the content management server, of managing an online/offline state of the content-using device; a content management step, by the content management server, of managing a state of use of the content in the content-using device; a second online/offline detection step, by the content-using device, of detecting whether the content-using device is online or offline with respect to the content management server; and a content control step, by the content-using device, of managing a period of validity of the content and controlling the use of the content according to the detection in the second online/offline control step.

Another aspect of the present invention is an integrated circuit that forms a content management server in a content distribution system including: the content management server, which manages a content; and a content-using device that uses the content, the integrated circuit comprising: a first online/offline detection unit that detects whether the content-using device is online or offline with respect to the content management server; a device management unit that manages an online/offline state of the content-using device; and a content management unit that manages a state of use of the content in the content-using device.

Another aspect of the present invention is an integrated circuit that forms a content-using device in a content distribution system including: a content management server that manages a content; and the content-using device, which uses

the content, the integrated circuit comprising: a second online/offline detection unit that detects whether the content-using device is online or offline with respect to the content management server; and a content control unit that manages a period of validity of the content and controls the use of the content according to the detection in the second online/offline control step.

(18) Specifically, each of the above-described devices is a computer system composed of a microprocessor, ROM, RAM, hard disk unit, display unit, keyboard, mouse, etc. Computer programs are stored on the RAM or the hard disk unit. Each device achieves its functions by the microprocessor operating according to the computer programs. In order to achieve predetermined functions, the computer programs are composed of a combination of multiple operation codes that indicate instructions for the computer.

(19) Part or all of the constituent elements constituting each of the above-described devices may be assembled as one system LSI (Large Scale Integration). A system LSI is an ultra-multifunctional LSI produced by integrating multiple components on one chip and, more specifically, is a computer system including a microprocessor, ROM, RAM, and the like. Computer programs are stored on the RAM. The system LSI achieves its functions by the microprocessor operating according to the computer programs.

Further, each of units of the constituent elements constituting each of the above-described devices may be separately integrated into a single chip, or may be integrated into a single chip including a part or all of the such units.

Further, the method applied for forming integrated circuits is not limited to the LSI, and the present invention may be realized on a dedicated circuit or a general purpose processor. For example, the present invention may be realized on an FPGA (Field Programmable Gate Array) being an LSI which can be programmed after manufacturing, or a reconfigurable processor being a LSI, reconfiguration of which could be made to the connection of internal circuit cells and settings.

Further in addition, if a new technology of circuit integration replacing that of the LSI emerges as a result of the progress made in the field of semiconductor technology or another technology deriving therefrom, the integration of function blocks may be performed applying such technology.

(20) Part or all of the constituent elements constituting each of the above-described devices may be assembled as an IC card or a single module that is attachable to and detachable from each device. The IC card/module is a computer system that includes a microprocessor, ROM, RAM, etc. The IC card/module may include therein the above-mentioned ultra-multifunctional LSI. The IC card/module achieves its functions by the microprocessor operating according to computer programs. The IC card/module may be tamper resistant.

(21) The present invention may be each of the above-described devices or control methods for controlling the above-described systems. The present invention may be computer programs that achieve the methods by a computer, or may be a digital signal comprising the computer programs.

The present invention may also be a computer-readable recording medium having recorded thereon the above-mentioned computer programs or digital signal. Examples of such a recording medium include a flexible disk, hard disk, CD-ROM, MO, DVD, DVD-ROM, DVD-RAM, BD (Blu-ray Disc), and semiconductor memory. The present invention may also be the digital signal recorded on such a recording medium.

The present invention may also be the computer programs or digital signal to be transmitted via networks, of which telecommunications networks, wire/wireless communications networks, and the Internet are representative, or via data broadcasting.

The present invention may also be a computer system comprising a microprocessor and memory, the memory storing the computer programs, and the microprocessor operating in accordance with the computer programs.

Also, another independent computer system may implement the computer programs or digital signal after the computer programs or digital signal is transferred via being recorded on the recording medium. Also, in the present invention, another independent computer system may implement the computer programs or digital signal after the computer programs or digital signal is transferred via one of the above-mentioned networks, etc.

(22) The present invention may be any combination of the above embodiments and modifications.

INDUSTRIAL APPLICABILITY

According to the content distribution system pertaining to the present invention, the management of a content in the content distribution system is performed according to a method for controlling the use of the content which is determined according to whether or not the content-using device is connected with the content management server. As such, protection of the content, which has been provided by a provider, is realized while a user utilizing the content is able to use the content with an enhanced degree of convenience. Due to this, the present invention is useful as a technology for performing management of a content distributed via a network.

REFERENCE SIGNS LIST

10, **20**, **30**, **40**, **50** content distribution system
100, **400**, **600**, **800**, **800***a* content management server
200, **500**, **700**, **900**, **900***a* content-using device
950*a* relay server
300 communication path
101 online/offline detection unit
102 device management unit
103 content management unit
104, **703** time measurement unit
201 online/offline notification detection unit
202 content control unit
203 time measurement unit
401 reception unit
402 invalidation instruction transmission unit
403 invalidation response reception unit
404 display unit
501 invalidation instruction reception unit
502 invalidation response transmission unit
601 online detection unit
602 device management unit
603 content management unit
701 online notification unit
702 content control unit
703 time measurement unit

The invention claimed is:

1. A content distribution system including: a content management server that manages a content; and a content-using device that uses the content, wherein

the content management server comprises:

a first connection detection unit that detects whether or not the content management server is connected with the content-using device;

a content management unit that manages the content according to a result of the detection by the first connection detection unit and holds information on how the content-using device controls the use of the content, and

the content-using device comprises:

a second connection detection unit that detects whether or not the content-using device is connected with the content management server;

a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and

a content control unit that controls the use of the content according to the method specified by the second selection unit.

2. The content distribution system of claim **1**, wherein

when the second connection detection unit detects that the content-using device has transitioned from being connected with the content management server to being unconnected with the content management server,

the second selection unit specifies, as the method for controlling the use of the content, a method according to a period of validity of the content, and

the content control unit sets a specific period of validity with respect to the content and, when the specific period of validity of the content expires, stops or denies the use of the content, and

when the first connection detection unit detects that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device,

the content management unit manages the content by using the method according to a period of validity of the content and sets a specific period of validity with respect to the content.

3. The content distribution system of claim **1**, wherein

when the second connection detection unit detects that the content-using device has transitioned from being unconnected with the content management server to being connected with the content management server,

the second selection unit specifies, as the method for controlling the use of the content, a method independent of a period of validity of the content, and

the content control unit cancels a specific period of validity set with respect to the content, and

when the first connection detection unit detects that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device,

the content management unit manages the content by using the method independent of a period of validity of the content, and cancels a specific period of validity set with respect to the content.

4. The content distribution system of claim **1**, wherein

when the second connection detection unit continuously detects that the content-using device is connected with the content management server,

the second selection unit continuously specifies, as the method for controlling the use of the content, a method according to a period of validity of the content, and

the content control unit performs updating of extending a specific period of validity set with respect to the content, and

when the first connection detection unit continuously detects that the content management server is connected with the content-using device,

the content management unit continuously manages the content by using the method according to a period of validity of the content and performs updating of extending a specific period of validity set with respect to the content.

5. The content distribution system of claim **1**, wherein

the content management server further comprises:

an invalidation reception unit that receives an invalidation instruction for invalidation of the content;

an invalidation instruction transmission unit that transmits the invalidation instruction to the content-using device; and

an invalidation response reception unit that receives, from the content-using device, an invalidation response as a response to the invalidation instruction,

the content-using device further comprises:

an invalidation instruction reception unit that receives the invalidation instruction from the content management server when the content-using device is connected with the content management server;

an invalidation unit that invalidates the content according to the invalidation instruction; and

an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server,

the second selection unit specifies, as the method for controlling the use of the content, a method according to a period of validity of the content when the content-using device is unconnected with the content management server,

the content control unit sets a specific period of validity with respect to the content, and

the invalidation unit invalidates the content when the specific period of validity of the content expires.

6. The content distribution system of claim **1**, wherein

the content-using device further comprises

a content deletion unit that deletes the content,

the content control unit further records information indicating deletion of the content when the content deletion unit has deleted the content,

the content-using device further comprises

a notification unit that,

(i) when the content-using device is connected with the content management server and the content deletion unit has deleted the content, immediately notifies the content management server of the deletion of the content and

(ii) when the content-using device is unconnected with the content management server and the content deletion unit has deleted the content, notifies the content management server of the deletion of the content after the content-using device is connected with the content management server, and

the content management unit further records information indicating the deletion of the content.

7. A content management server managing a content and providing the content to a content-using device, comprising:

a first connection detection unit that detects whether or not the content management server is connected with the content-using device; and

a content management unit that manages the content according to a result of the detection by the first connec-

tion detection unit and holds information on how the content-using device controls the use of the content, wherein

when the first connection detection unit detects that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device,

the content management unit manages the content by using a method according to a period of validity of the content and sets a specific period of validity with respect to the content.

8. The content management server of claim **7**, wherein

when the first connection detection unit detects that the content management server has transitioned from being unconnected with the content-using device to being connected with the content-using device,

the content management unit manages the content by using a method independent of a period of validity of the content, and cancels a specific period of validity set with respect to the content.

9. The content management server of claim **7**, wherein

when the first connection detection unit continuously detects that the content management server is connected with the content-using device,

the content management unit continuously manages the content by using a method according to a period of validity of the content and performs updating of extending a specific period of validity set with respect to the content.

10. The content management server of claim **7**, wherein

the first connection detection unit

performs polling with respect to the content-using device at a predetermining timing,

detects that the content management server is connected with the content-using device when receiving a polling response from the content-using device in response to the polling, and

detects that the content management server is unconnected with the content-using device when the polling response is not received from the content-using device within a predetermined interval.

11. The content management server of claim **10**, wherein

the first connection detection unit determines the predetermined timing according to a period of validity of the content.

12. The content management server of claim **7**, wherein

the first connection detection unit, when receiving a polling signal from the content-using device at a predetermined timing,

detects that the content management server is connected with the content-using device, and

transmits a polling response to the content-using device.

13. The content management server of claim **7**, wherein

the first connection detection unit detects that the content management server is connected with the content-using device when receiving a notification from the content-using device that the content-using device is connected with the content management server.

14. The content management server of claim **7** further comprising:

an invalidation reception unit that receives an invalidation instruction for invalidation of the content;

an invalidation instruction transmission unit that transmits the invalidation instruction to the content-using device; and

an invalidation response reception unit that receives, from the content-using device, an invalidation response as a response to the invalidation instruction.

15. The content management server of claim **14** further comprising

a display unit that displays a status of the invalidation of the content performed in accordance with the invalidation instruction by referring to the invalidation response received from the content-using device, wherein

the display unit,

(i) displays invalidation completion information indicating that the invalidation of the content has been completed by the content-using device, when connected with the content management server, and,

(ii) displays a period of validity of the content set in the content-using device, when unconnected with the content management server.

16. The content management server of claim **7** further comprising

a display unit that displays how the management of the content is being performed.

17. A content-using device that uses a content provided from a content management server managing the content, comprising:

a second connection detection unit that detects whether or not the content-using device is connected with the content management server;

a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and

a content control unit that controls the use of the content according to the method specified by the second selection unit, wherein

when the second connection detection unit detects that the content-using device has transitioned from being connected with the content management server to being unconnected with the content management server,

the second selection unit specifies, as the method for controlling the use of the content, a method according to a period of validity of the content, and

the content control unit sets a specific period of validity with respect to the content and, when the specific period of validity of the content expires, stops or denies the use of the content.

18. The content-using device of claim **17**, wherein

when the second connection detection unit detects that the content-using device has transitioned from being unconnected with the content management server to being connected with the content management server,

the second selection unit specifies, as the method for controlling the use of the content, a method independent of a period of validity of the content, and

the content control unit cancels a specific period of validity set with respect to the content.

19. The content-using device of claim **17**, wherein

when the second connection detection unit continuously detects that the content-using device is connected with the content management server,

the second selection unit continuously specifies, as the method for controlling the use of the content, a method according to a period of validity of the content, and

the content control unit performs updating of extending a specific period of validity set with respect to the content.

20. The content-using device of claim 17, wherein

the second connection detection unit detects whether or not the content-using device is connected with the content management server by performing either one of or any combination of:

(i) detecting, at a predetermined timing, whether or not a polling signal is received from the content management server at the predetermining timing;

(ii) detecting whether or not a communication module provided to the content-using device is activated;

(iii) detecting whether or not the content-using device is located within a distance, from an access point, within which radio signals from the content-using device reach the access point; and

(iv) detecting whether a user operation is performed with respect to the content-using device for activating or deactivating communication by the content-using device.

21. The content-using device of claim 17, wherein

the second connection detection unit, when detecting that the content-using device is connected with the content management server, performs polling with respect to the content management server and receives a polling response from the content management server as a response to the polling, and

the content control unit, when the polling response permits extension of a period of validity set with respect to the content, performs updating of extending the period of validity.

22. The content-using device of claim 21, wherein

the second connection detection unit determines a timing at which the polling is performed according to the period of validity.

23. The content-using device of claim 17, wherein

the second connection detection unit, when detecting that the content-using device is connected with the content management server, transmits a notification to the content management server that the content-using device is connected with the content management server, and

the second connection detection unit detects whether or not the content-using device is connected with the content management server by performing either one of or any combination of:

(i) detecting, at a predetermined timing, whether or not a polling signal is received from the content management server at the predetermining timing;

(ii) detecting whether or not a communication module provided to the content-using device is activated;

(iii) detecting whether or not the content-using device is located within a distance, from an access point, within which radio signals from the content-using device reach the access point; and

(iv) detecting whether a user operation is performed with respect to the content-using device for activating or deactivating communication by the content-using device.

24. The content-using device of claim 17 further comprising:

an invalidation instruction reception unit that receives an invalidation instruction from the content management server when the content-using device is connected with the content management server;

an invalidation unit that invalidates the content according to the invalidation instruction; and

an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server.

25. The content-using device of claim 24 further comprising:

a display unit that displays a record of the invalidation of the content performed according to the invalidation instruction when the invalidation unit has invalidated the content.

26. The content-using device of claim 17 further comprising

a display unit that displays how the control of the use of the content is being performed by the content control unit.

27. The content-using device of claim 17 further comprising:

an invalidation instruction reception unit that receives an invalidation instruction from the content management server when the content-using device is connected with the content management server;

an invalidation unit that invalidates the content according to the invalidation instruction;

an invalidation response transmission unit that generates an invalidation response when the content has been invalidated and transmits the invalidation response to the content management server, wherein

the second selection unit specifies, as the method for controlling the use of the content, a method according to a period of validity of the content when the content-using device is unconnected with the content management server,

the content control unit sets a specific period of validity with respect to the content, and

the invalidation unit invalidates the content when the specific period of validity of the content expires.

28. The content-using device of claim 17 further comprising

a content deletion unit that deletes the content, wherein

the content control unit further records information indicating deletion of the content when the content deletion unit has deleted the content,

the content-using device further comprises:

a notification unit that,

(i) when the content-using device is connected with the content management server and the content deletion unit has deleted the content, immediately notifies the content management server of the deletion of the content and,

(ii) when the content-using device is unconnected with the content management server and the content deletion unit has deleted the content, notifies the content management server of the deletion of the content after the content-using device is connected with the content management server.

29. A control method used in a content distribution system including: a content management server that manages a content; and a content-using device that uses the content, comprising:

a first connection detection step, by the content management server, of detecting whether or not the content management server is connected with the content-using device;

a content management step, by the content management server, of managing the content according to a result of the detection in the first connection detection step and of holding information on how the content-using device controls the use of the content;

a second connection detection step, by the content-using device, of detecting whether or not the content-using device is connected with the content management server;

a second selection step, by the content-using device, of specifying a method for controlling the use of the content according to a result of the detection in the second connection detection step; and

a content control step, by the content-using device, of controlling the use of the content according to the method specified in the second selection step.

30. An integrated circuit that forms a content management server managing a content and providing the content to a content-using device, comprising:

a first connection detection unit that detects whether or not the content management server is connected with the content-using device; and

a content management unit that manages the content according to a result of the detection by the first connection detection unit and holds information on how the content-using device controls the use of the content, wherein

when the first connection detection unit detects that the content management server has transitioned from being connected with the content-using device to being unconnected with the content-using device,

the content management unit manages the content by using a method according to a period of validity of the content and sets a specific period of validity with respect to the content.

31. An integrated circuit that forms a content-using device that uses a content provided from a content management server managing the content, comprising:

a second connection detection unit that detects whether or not the content-using device is connected with the content management server;

a second selection unit that specifies a method for controlling the use of the content according to a result of the detection by the second connection detection unit; and

a content control unit that controls the use of the content according to the method specified by the second selection unit, wherein

when the second connection detection unit detects that the content-using device has transitioned from being connected with the content management server to being unconnected with the content management server,

the second selection unit specifies, as the method for controlling the use of the content, a method according to a period of validity of the content, and

the content control unit sets a specific period of validity with respect to the content and, when the specific period of validity of the content expires, stops or denies the use of the content.

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